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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVI
New Series, Vol. XVIII.

NEW YORK, JULY 2, 1919

Number
1

Stone Macadam Roads*

How Shall We Build Them Now?

By W. C. BUETOW †

Until recently—say, three years ago—we concerned ourselves with the question, "How should a good water-bound macadam road be built?" The problem that confronts us at the present time is: How shall we now build our macadam surfaces? Our present-day mode of travel has brought about this last question.

Previous to the past three years construction problems were thrashed out here but now maintenance questions are becoming uppermost in our minds. It is due to maintenance and maintenance costs that our minds have turned to the problem of securing better surfaces in order to reduce the upkeep costs. You have all found out that with increased motor traffic, of both pleasure and commercial cars, the older, and even some of the newer, water-bound macadam roads, depending upon locality, are going to pieces very rapidly. The yearly costs have been climbing, and in order to do away with this to a certain extent you have all sought to construct a surface with the maintenance built in.

As we think about our highway problems we also picture in our minds a system of highways. The outline of the counties stands out plainly and within the borders we see wide bands crawling in different directions, like the main branches of a tree. These are the main arteries of travel and the surfaces are of the higher types, concrete and brick. From these main arteries we see other roads, with their feeders,

A MAIN TRUNK ROAD IN MASSACHUSETTS—OLD MACADAM ROADWAY RESURFACED WITH THREE INCHES OF BITUMINOUS MACADAM.

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*Paper presented at the Eighth Annual Road School of the Wisconsin Highway Commission, Madison, Wis.

†Division Engineer, Wisconsin Highway Commission.

crawling away, carrying lighter travel and bringing traffic from the remotest part of the county to the business centers. Each county has its own picture to draw depending on the amount of travel passing over the roads. We are now considering only the more lightly traveled roads, starting with the primary feeders emptying their travel on to the main highways surfaced with either concrete or brick.

The primary feeders may be constructed of bituminous macadam either by the mixing method or by the penetration method.

The foundation for the wearing surface is the same for either road. The thickness depends on the nature of the subgrade. The size of stone usually used is the same as the No. 1 stone of a water-bound macadam, stone passing a 3½-in. ring and retained on a 2½-in. screen. Spreading and rolling are the same as for the ordinary macadam work. However, the base course is filled with sand or screenings and, if deemed necessary, flushed with water to make it firmer. The reason for filling the base course is to make the base firmer and to prevent the bitumen from running down into the voids, thereby wasting the bitumen and drawing it away from the wearing surface where its presence is very essential.

It is not essential that a detailed description be given of the various steps of the mixing method, because of the plant involved. Briefly the method is this. The stone and bitumen are mixed hot in a specially prepared mixer at either a stationary or portable plant. Even with a portable plant it may be advisable to set up at the stone pile and haul the mixed product to the road. The mixed material must be delivered on the road hot so that it can be spread evenly and properly rolled. Even spreading and proper rolling are extremely important. Great care must be exercised that the bitumen is not burned because that particular batch will fail in the pavement.

The penetration method requires less expensive equipment and for that reason a more detailed description will be given. Having the base prepared, the surface stone is carefully spread so as to get a uniform thickness. Here, as in water-bound macadam work, the stone should not be dumped in a pile and then shoveled over the required area. Dumping stone in piles compacts the bottom and allows the coarse stone to roll to the sides. This gives the surface an uneven density.

The size of the stone depends somewhat on the thickness of the wearing surface and the hardness of the rock. The size usually used ranges from 1¼ to 2½ in., but may run slightly larger for soft stone and finer for the harder rocks like trap and granite. Uniformity is an essential requirement and great care must be exercised to see that the material is clean and free from dust and dirt.

The rolling of the rock is done with an ordinary road roller of 10 tons weight and in the same manner as in water-bound construction. Too much rolling can be done on the softer rock. All that is required for soft stone is to shape the road and lock the stone. The surface should be open to admit the bitumen, yet not so open as to allow the binder to pass through to the base course. The bitumen is a binder and must get between the stones and thoroughly coat them. If the roller crushes the rock too much, closing up the voids, such spots must be removed, otherwise the bitumen lies on top as a mat only to peel off leaving a bare and weak spot in the surface. Hard rock like granite cannot always be locked without the addition of ¾-in. keystone. In addition to locking the stone, the ¾-in. chips reduce the voids and prevent the binder from passing through to the base course.

Having the stone properly rolled, the surface is ready for the bitumen. It is not necessary to go into details about how hot the asphalt or tar is to be heated before it is applied, because different products require different spreading temperatures. Nevertheless the binder must be properly heated and the stone must be dry.

On large jobs the binder is shipped in tank cars and is heated at a convenient point. The hot bitumen is hauled to the road in tank wagons, fitted so that the binder can be forced into the pavement under pressure by either steam or air. On small jobs, or where it is difficult to operate tank wagons, the binder is shipped in barrels and heated in open kettles on the road. Hand-pouring pots are then used to spread the bitumen. If the tank wagons disturb the stone, breaking the bond, it may be advisable to employ hand pouring for the first application, while for the second or lighter coat the tank wagon may be used to better advantage.

The first aplication requires about 1.5 gal. per square yard and it must be evenly applied so that each square yard gets the specified amount. As the work progresses, whether the binder is applied by pressure wagon or by hand, the application should be checked to see that the bitumen used has covered the required area.

When the first aplication has been put on, the surface should have a uniform black appearance and the spaces between the stones should be open. Stone chips, ¾ in. in size, or whatever size is necessary for the size of the voids, are now spread evenly over the surface in just sufficient quantity to keep the roller from sticking. The road is again rolled, forcing the chips into the voids. All excess material is now swept off and the road is ready for the second application. If considerable excess material is allowed to remain on the surface, the second application of binder may not adhere properly to the road and will peel off. The second or seal coat of about 0.5 gal. per square yard is now applied and must be spread evenly. As soon as the bitumen is on, the surface is covered with stone chips or pea gravel and a final rolling prepares the road for travel.

In either of the two methods mentioned, uniformity is the keynote. It is highly important that the size of stone be kept uniform, that the temperature be uniform that the materials be placed uniformly and that each course gets uniform rolling.

So much for the primary feeders. The secondary feeders, or the feeders to the primary roads, are the still less traveled roads in the highway system. For these the modified penetration is applicable.

The so-called modified penetration calls for lighter asphalts and tars than those ordinarily used for surface treatments. These light products do not have to be heated to bring them to a liquid state.

The base course of the so-called modified penetration macadam road is no different from that of the plain water-bound macadam construction. In the case of the soft limestone, there is enough locking due to the crushing action of the roller, and the small pieces broken from the corners of the stone during the rolling fills the voids to some extent. This is not true of the harder stones like trap and granites and the base course must be filled with clay, sand or screenings. Clay is a good filler and if not used to excess it can be drawn up to help bind the second course. It should not be drawn up more than half way into the second course because asphalts and tars will not stick to dirt. Whether the base course is filled with clay, sand or screenings, or whether it is left open, the stone must be thoroughly rolled, because the screenings are not flushed in from the second course as is the case in the water-bound road. When the base course is in shape, the second course stone is spread and rolled. The success or failure of the work lies in the locking of the second course, and this must be mainly brought about in the rolling, because the light oils do not have the cementing properties of the heavier binders used in the mixing or penetration methods. The locking of the

(Continued on page 6)

Proposed Tests and Specifications for Road Building Materials

Testing Methods and Specifications Recommended in the Report of Committee D-4 on Road Materials of the American Society for Testing Materials

Among the reports and papers presented at the 22d annual meeting of the American Society for Testing Materials, held at Atlantic City, N. J., on June 24, 25, 26 and 27, that which is probably of the greatest interest to road builders is the report of Committee D-4 on Road Materials. The report recommended for adoption two tests, one for the determination of the apparent specific gravity of sand, stone and slag screenings, and other fine non-bituminous highway material, and one for the determination of the softening point of bituminous materials other than tar products. It also proposed a revision of the standard test for the loss on heating of oil and asphaltic compounds, and a tentative method for the determination of the softening point of tar products (cube in water method). Three specifications were also recommended, the first for the materials for cement grout filler for brick, stone block and wood block pavement; the second for the materials for cement mortar beds for brick, stone block, and wood block pavement, and the third for the blocks for granite block pavement.

Apparent Specific Gravity of Sand, Stone and Slag Screenings, and Other Fine Non-Bituminous Highway Materials.

The two tests recommended for adoption are designated as D 55-18 T and are known as the "Le Chatelier" and the "Jackson" tests. They were described in "Good Roads" for August 10, 1918. The committee recommended that they be referred, without change, to letter ballot for adoption as standard.

Softening Point of Bituminous Materials Other Than Tar Products.

This test, which was proposed as tentative in 1916, has been revised and the committee recommended that it be referred to letter ballot for adoption as standard. The test is known as the ring and ball method and was described in the report as follows:

1. The softening of bituminous materials generally takes place at no definite moment or temperature. As the temperature rises, they gradually and imperceptibly change from a brittle or exceedingly thick and slow flowing material to a softer and less viscous liquid. For this reason the determination of the softening point must be made by a fixed, arbitrary and closely defined method if the results obtained are to be comparable.

I. Apparatus.

2. The apparatus shall consist of the following: (a) A brass ring 15.875 mm. (⅝ in.) in diameter and 6.35 mm. (¼ in.) deep; thickness of wall, 2.38 mm. (3/32 in.); permissible variation on inside diameter and thickness of ring, 0.25 mm. (0.01 in.). This ring shall be attached in a convenient manner to a No. 15 B.&S. gage brass wire (diameter 1.79 mm.=0.0703 in.) See Fig. 1.

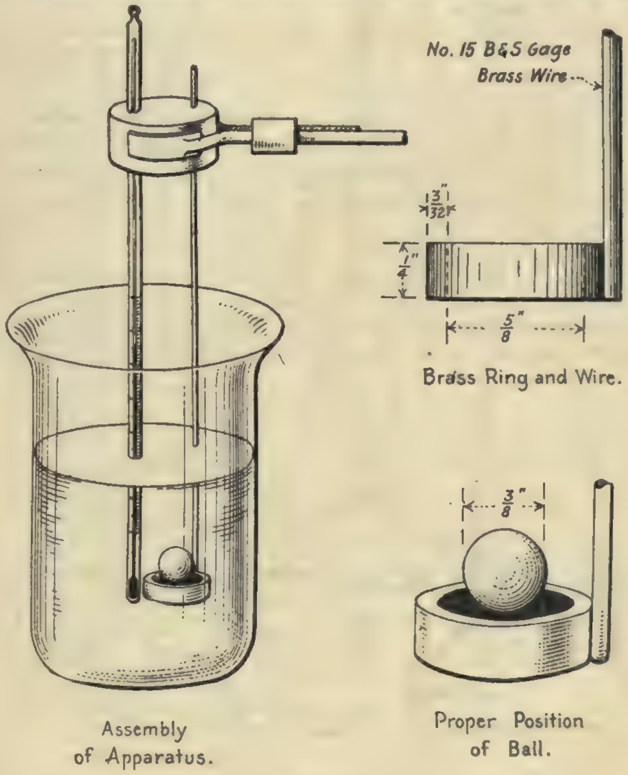
(b) A steel ball 9.53 mm. (⅜ in.) in diameter weighing between 3.45 and 3.55 g.

(c) A glass vessel, capable of being heated, not less than 11 cm. (4.33 in.) in diameter by 14 cm. (5.51 in.) deep. (A 600-cc. beaker, Griffin low form, meets this requirement.)

(d) A thermometer which shall conform to the following specifications:

Total length	370-400 mm.	(14.57 -15.75 in.)
Diameter	6.5-7.5 mm.	(0.255- 0.295 in.)
Bulb length	not over 14 mm.	(Not over 0.55 in.)
Bulb diameter	4.5-5.5 mm.	(0.177- 0.217 in.)

The scale shall be engraved upon the stem of the thermometer, shall be clear cut and distinct, and shall run from 0° to 80° C. (32 to 176° F.) in 1/5° C. divisions. It shall commence not less than 7.5 cm. (2.95 in.) above the bottom of the bulb. The thermometer shall be furnished with an expansion chamber at the top and have a ring for attaching tags. It shall be made of a suitable quality of glass and be so annealed as not to change its readings under conditions of use. It shall be correct to 0.25°C. (0.45°F.) as determined by comparison at full immersion with a similar thermometer calibrated at full immersion by the United States Bureau of Standards.



Brass Ring and Wire.

Assembly of Apparatus.

Proper Position of Ball.

FIG. 1.

II. Preparation of Sample.

3. The sample shall be melted and stirred thoroughly, avoiding incorporating air bubbles in the mass, and then poured into the ring so as to leave an excess on cooling. The ring, while being filled, should rest on a brass plate which has been amalgamated to prevent the bituminous material from adhering to it. After cooling the excess material shall be cut off cleanly with a slightly heated knife.

III. Testing.

(A) Bituminous Materials Having Softening Points 90° C. (194° F.) or Below.

4. Assemble the apparatus as shown in Fig. 1. Fill the glass vessel to a depth of substantially 8.25 cm. (3.25 in.), with freshly boiled, distilled water at 5°C. (41°F.). Place the ball in the center of the upper surface of the bitumen in the ring and suspend it in the water so that the lower surface of the filled ring is exactly 2.54 cm. (1 in.), above the bottom of the glass vessel and its upper surface is 5.08 cm. (2 in.), below the surface of the water. Allow it to remain in the water for 15 minutes before applying heat. Suspend the thermometer so that the bottom of the bulb is level with the bottom of the ring and within 0.635 cm. (¼ in.), but not touching, the ring.

5. Apply the heat in such a manner that the temperature of the water is raised 5°C. (9°F.), each minute.

6. The temperature recorded by the thermometer at the in-

stant the bituminous material touches the bottom of the glass vessel shall be reported as the softening point.

7. The rate of rise of temperature shall be uniform and shall not be averaged over the period of the test. The maximum permissible variation for any minute period after the first three shall be ± 0.5° C. (0.9° F.). All tests in which the rate of rise in temperature exceeds these limits shall be rejected.

(B) Bituminous Materials Having Softening Points Above 90°C. (194°F.).

8. Use the same method as given under (A), except that glycerine shall be used instead of water.

IV. Accuracy.

9. The limit of accuracy of the test is ± 0.5° C. (0.9° F.).

V. Precautions.

10. The use of freshly boiled distilled water is essential, as otherwise air bubbles may form on the specimen and affect accuracy of the results. Rigid adherence to the prescribed rate of heating is absolutely essential in order to secure accuracy of results.

A sheet of paper placed on the bottom of the glass vessel and conveniently weighted will prevent the bituminous material from sticking to the glass vessel, thereby saving considerable time and trouble in cleaning.

Loss on Heating of Oil and Asphaltic Compounds.

The committee received a number of comments and criticisms during 1919 relative to the description of this method and has elaborated the former description. It recommended that the method, as revised, be published as tentative. The committee's description of the test follows:

This test is used to determine the loss in weight (exclusive of water) of oil and asphaltic compounds when heated as hereinafter prescribed. The material under examination must therefore first be tested for water and if water is found to be present, it must be removed by suitable methods of dehydration before the material is subjected to the loss on heating test; or another sample obtained which is free from water.

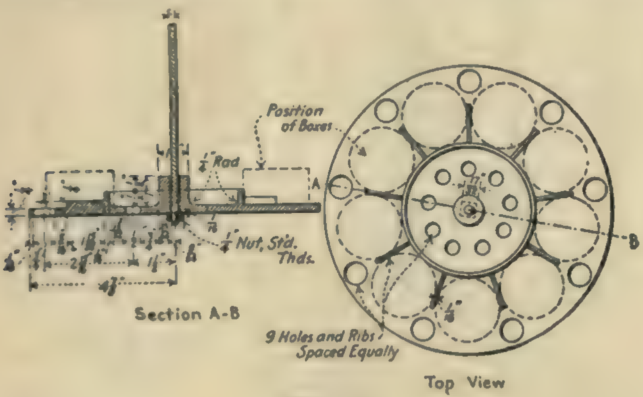


FIG. 2.

I. Apparatus.

2. The oven may be either circular or rectangular in form and may be heated by either gas or electricity. Its interior dimensions shall be as follows: height, not less than 40.64 cm. (16 in.); width and depth or diameter, at least 4.08 cm. (2 in.) greater than the diameter of the revolving shelf.

It shall be well ventilated and shall be fitted with a window in the upper half of the door, so placed and of sufficient size to permit the accurate reading of the thermometer without opening the door. It shall also be provided with a perforated circular shelf preferably of approximately 24.8 cm. (9.75 in.) in diameter. This shelf shall be placed in the center of the oven and shall be suspended by a vertical shaft and provided with mechanical means for rotating it at the rate of 5 to 6 revolutions per minute. It shall be provided with recesses equidistant from the central shaft in which the tins containing the samples are to be placed. (A recommended form of aluminum shelf is shown in Fig. 2).

3. The thermometer shall be between 12.7 cm. (5 in.) and 15.24 cm. (6 in.) in length and the mercury bulb shall be from 10 to 15 mm. (0.39 to 0.59 in.) in length. The scale shall be engraved on the stem, shall be clear cut and distinct, and shall run from 150° to 175° C. (302° to 357° F.) in 1° C. divisions and shall commence substantially 3.81 cm. (1½ in.) above the top of the bulb. Every fifth graduation shall be larger than the intermediate ones and shall be numbered. The degrees shall be substantially 3.17 mm. (⅛ in.) apart. The thermometer shall be furnished with an expansion chamber at the top and have a ring for attaching tags. It shall be made of a suitable quality of glass and be so annealed as to not change its readings under conditions of use. It shall be correct to 0.25°C. (0.45°F.) as determined by comparison at full immersion with a similar thermometer calibrated at full immersion by the United States Bureau of Standards.

4. The container in which the sample is to be tested shall be of tin, cylindrical in shape, and shall have a flat bottom. Its inside dimensions shall be substantially as follows: diameter, 55 mm. (2.17 in.); depth, 35 mm. (1.38 in). (A 3-oz. Gill style ointment box, deep pattern, fulfills these requirements).

II. Preparation of Sample.

5. The sample as received shall be thoroughly stirred and agitated, warming, if necessary, to insure a complete mixture before the portion for analysis is removed.

III. Testing.

6. Weigh 50 g. of the water-free material to be tested into a tared container conforming to the requirements of Section 3. Bring the oven to a temperature of 163°C. (325°F.), and place the tin box containing the sample in one of the recesses of the revolving shelf. The thermometer shall be immersed for the depth of its bulb in a separate 50-g. sample of the material under test, placed in a similar container, and shall be conveniently suspended from the vertical shaft. This sample shall rest in one of the recesses upon the same shelf and revolve with the sample or samples under test. Then close the oven and rotate the shelf 5 to 6 revolutions per minute during the entire test. Maintain the temperature at 163°C. (325°F.) for 5 hours, then remove the sample from the oven, cool and weigh, and calculate the loss due to volatilization.

7. During the 5-hour period the temperature shall not vary more than 1°C. All tests showing a greater variation in temperature shall be rejected.

8. Up to 5 per cent. loss in weight the results obtained may be considered as correct within 0.5. Above 5 per cent. loss in weight the numerical limit of error increases 0.01 for every 0.5 per cent increase in loss by volatilization as follows;

Volatilization Loss Per Cent	Numerical Correction	True Volatilization Loss Per Cent
5.0	±0.50	4.50 to 5.50
5.5	±0.51	4.91 " 6.01
6.0	±0.52	5.48 " 6.52
10.0	±0.60	9.40 " 10.60
15.0	±0.70	14.30 " 15.70
25.0	±0.90	24.10 " 25.90
40.0	±1.20	38.80 " 41.20

V. Precautions.

9. Under ordinary circumstances a number of samples having about the same degree of volatility may be tested at the same time. Samples varying greatly in volatility should be tested separately. Where extreme accuracy is required not more than one material should be tested at one time and duplicate samples of it should be placed simultaneously in the oven. Such duplicates shall be checked within the limits of accuracy given above. Results obtained on samples showing evidences of foaming during the test shall be rejected.

Note: If additional periods of heating are desired it is recommended that they be made in successive increments of 5 hours each.

When the penetration of the sample after heating is required, melt the residue in the container at the lowest possible temperature and thoroughly mix by stirring, taking care to avoid incorporating air bubbles in the mass. Then bring it to the standard temperature and test as prescribed under the directions for the Standard Test for Penetration of Bituminous Materials (Serial Designation: D 5) of the American Society for Testing Materials.

(To be concluded)

Louisiana Bond Law Legal

Supreme Court Affirms Validity of Measure in a Recent Decision

The legality of the law providing for the issue of road bonds carrying a 10-mill tax for a 40-year period has been affirmed in a recent decision of the Supreme Court of Louisana.

The decision was handed down in a suit brought by a taxpayer against the Police Jury of Washington Parish. According to the decision the constitution, as amended, authorizes the voting of bonds for a period of 40 years and the levying of a tax of not over 10 mills.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIII July 2, 1919 No. 1

ANNOUNCEMENT

Beginning with this issue, the publication day of "Good Roads" is changed from Saturday to Wednesday.

This change has been made to facilitate printing and mailing and it is believed that it will prove to the advantage of both the readers and advertisers.

THE TOWNSEND BILL FOR A NATIONAL HIGHWAY SYSTEM

Not long ago road improvement was strictly a local matter. Towns, road districts and counties built such roads as were required to meet local needs. This did not give us state-wide road systems.

Since the states took up road improvement such statewide highway systems have been laid out in many cases and But this has not given the country a nation-wide system of highways.

Pending federal legislation, of which the most favored seems to be the Townsend Bill, proposes to remedy this situation by the establishment of a national highway system to be built by the Federal Government acting through a federal highway commission.

The need for interstate highways, we believe, is well established. Highway transportation has become a fact and its future development seems assured. For reasons that are patent to anyone conversant with present-day transportation problems, national roads seem as necessary to the traffic of the present and of the future as state roads were to the traffic of five, ten or fifteen years ago.

Granting, then, the need of a national highway system, how is it to be obtained?

In the first place, can state work yield the desired result? Both experience and an understanding of the conditions governing such work indicate that it cannot. Only a very casual knowledge of the relations between the systems of the different states is sufficient to demonstrate that state control has not given us interstate roads. Any motorist or truck operator who drives from one state into another is well aware of the lack of coordination between such systems. For an illuminating discussion of the conditions under which state work is done—conditions that make it well nigh impossible for the most able and willing highway official to cooperate with another official in an adjoining state—reference may be had to the statement by Secretary Shirley, of the Highway Industries Association, which is printed elsewhere in this issue. Mr. Shirley has been a county and a state highway engineer, and knows whereof he speaks.

If state efforts alone cannot provide a national highway system, can we expect results from the federal aid plan now in effect?

There is certainly ground for the belief that we cannot, though it must be admitted that our experience with the federal aid plan now in force is not conclusive. Federal aid was inaugurated only three years ago, and in the interim conditions have been abnormal, due to the Great War. But there are certain inherent defects in the present plan that do not augur well for its success. For a more complete discussion of these defects reference is again made to the statement by Mr. Shirley.

If neither state control alone nor the present system of federal aid is what is required for the construction of a national highway system, it seems fairly obvious that some different plan involving federal control is required. As stated, the Townsend Bill attempts to provide a plan. Therefore, it becomes a measure of the greatest moment to road builders and to all of those interests concerned directly or indirectly with the betterment of the nation's highways. It is believed by some that Congress will enact road legislation of some sort at the present session; certainly the matter will come up for consideration at this or some session in the near future. Road builders must use all the influence they possess to secure the enactment of a law that will be workable and that will produce the desired results. This means hard work—thankless work, perhaps—but the duty rests upon all those who can do anything to do their utmost.

ROUTES AND SCHEDULES FOR MOTOR TRUCK HAULING

In a previous issue ("Preliminary Surveys for Motor Truck Routes," page 213, May 17, 1919) attention was called to some of the pitfalls to be avoided in the establishment of motor truck express routes. It was pointed out that while this new business offers worth-while opportunities, it should be undertaken only after a most careful investigation of the territory to be served and of all the factors entering into operation.

That discussion was based upon a paper presented at the annual meeting of the National Highway Traffic Association by J. A. Collins, Investigator in Market Surveys of the Bureau of Markets. The paper, "Transportation Surveys for Rural Motor Express Routes," dealt with the investigations prerequisite to successful operation. In this issue a statement by an official of the B. F. Goodrich Rubber Co. calls attention to matters that must be given careful consideration not only in the preliminary surveys, but also after a business has been established.

It should be obvious that the laying out of routes and the preparation of schedules are essential to the successful operation of a motor truck haulage service. In almost all cases, undoubtedly, some attempt is made to arrange routes in such a way as to get the most service from the trucks for the mileage covered and to fix schedules so as to save time. It is possible, however, that the problem is not always given as careful consideration as its importance warrants.

The first step in the arrangement of routes, as is noted in the statement referred to, is to secure a map of the territory covered. But effective routing requires more knowledge than can be gained from a map, however complete and reliable it may be. Besides knowing that there are certain highways connecting the various points to be served and tapping the country where freight originates, it is necessary to know whether or not the roads are paved; the kind and condition of the pavements where they exist; and the traffic conditions at different hours, on different days of the week and at different seasons of the year—in fact to get all data that can be gotten about the roads. To obtain this information it might be advisable to follow the example of the larger automobile organizations, and employ "pathfinders."

Having laid out a system of routes, the matter of schedules must be given perhaps even closer study. In this, as in the collection of data on routes, investigations must be made on the ground, for, as is pointed out, running time can be determined only by experience. Since the prime object of the schedule is to enable the trucks to do the maximum amount of work in the minimum amount of time, it is obvious that advantage must be taken of every opportunity to save time. Traffic data, already obtained in the survey of routes, will enter into the arrangement of the schedules, as will also the several elements cited in the statement, including train and ferry time cards, loading time, hours of labor and a variety of other factors.

As highway transportation develops, keen competition between operators will come. Until such time as carrying charges become more or less standardized, the operators that can work for the lowest prices will get the business. And when prices do reach a level, the greatest profits will be made by those who can operate at the lowest costs. In either case, routing and schedules are going to be of the utmost importance in reducing operating costs, and consequently in increasing profits. Time and money spent in their investigation will, therefore, be well invested.

Stone Macadam Roads

(Continued from page 2)

stone by rolling applies particularly to the softer stone and is not true of harder rock like granite. Too much rolling of the soft rock is worse than not enough, because the crushing and grinding action under the roller wheels will make the surface too dense. Excessive rolling of hard rock tends to smooth it up, making it that much harder to bind. During the rolling it is very essential to see that voidless spots do not develop. If any do occur, due to the crushing of the stone or from material improperly screened, they should be raked out and the holes filled with clean stones. A uniform surface is necessary and any spots filled up tight before the oil is applied break up the uniformity and leave weak spots in the pavement.

The surface at this stage is very porous and if the bitumen were applied it would run through to the subgrade. An enormous amount of oil would be required to fill up the surface besides making it soft and spongy. To keep the stones from shifting under travel, the voids must be partially filled before oil is applied. The screenings must be applied evenly and when dry. The roller is operated over the road during this process and shakes the dry screenings into the voids. There should be several steel push brooms on the job so that the uneven patches of screenings may be spread properly. Screenings should be applied until the voids are about filled, giving the surface a mottled appearance. The first application of 0.5 gal. of road oil is put on by a pressure distributor. The force of the spray cleans the fine dust off the exposed stone, besides forcing the screenings further into the voids. When asphalt is used, it is advisable to sprinkle the stone to remove the dust, because it does not penetrate as readily as the tars. Spots that are impervious will show up very plainly after the oil is applied, presenting smooth, glossy, unbroken surfaces. These places, if not removed, are getting but a surface treatment rather than being impregnated. Consequently these spots do not have the same wearing qualities as the balance of the pavement and in a short time, bald spots appear. Should such appear after the road is opened to travel, immediate attention should be given them because such a spot grows rapidly in size and depth.

After the first oil is applied, a light coat of screenings should be spread and followed up with the roller. If the surface was properly filled before the oil was applied, there will not be enough oil in the road to cause the wheels of the roller to pull up patches of the surface. If there should be too much oil on the road, the only thing to do is to let the road stand as it is for a day or two, giving the oil a chance to soak in. If allowed to stand too long, a light application of oil may be necessary before additional screenings are put on. The roller brings the oil back to the surface and bonds or mixes the screenings in. A second application of 0.5 gal. of oil is given the surface and followed up with a heavier course of screenings. The second coat of screenings can be heavier than the first because the oil will not soak in so much. The roller will again bring the oil to the surface and mix it with the screenings. The surface should now be well filled up, but in case it is not, a third application of 0.125 gal, per square yard is applied. Clean stone chips or torpedo sand are better for the finish coat than dusty screenings.

When granite or trap rock is used, and its screenings are used for filler, it is quite necessary to use ¾-in. keystone to help lock the second course. The hard rock does not absorb the oil as the soft stone does and consequently the oil is drawn to the surface more readily. If screenings are added in sufficient quantity to keep the rollers from pulling up patches, there is danger of getting too much material on the road, causing the surface to flake under the action of the roller. Should this happen, a light sprinkling of ¾-in. stone must be applied and rolled in, otherwise the horse traffic will chop the flakey spots to pieces, causing holes to form.

No matter what material is used, soft or hard rock, care must be taken that a thick mat of oil and screenings is not formed on the surface. After the road is finished, it should be allowed to stand for several days before traffic is allowed to use it. Automobile traffic is a benefit to this type of road because the pneumatic tires iron out the surface. If there are places which look as if there were not enough oil, the chances are that after the road has been open to travel for a few days, the oil will be drawn to the surface, giving it the appearance of a sheet asphalt pavement.

It is very doubtful, in my mind, if we should build any more water-bound macadam roads. If they are built they must be surface treated immediately. Then you will have paid for watering and oiling the road, while, if the modified penetration method is used the watering cost has been eliminated. In addition to this, the oil is incorporated in the surface and not merely lying on the surface as is the case in surface treated work. The results obtained by the modified penetration method have placed the water-bound macadam in the class of the "has beens."

The Townsend Federal Road Law

Statement by Secretary Shirley of the Highway Industries Association Urging Passage of the Pending Measure by Congress

As noted in previous issues, a measure, known as the Townsend Bill, providing for the construction of a national highway system by the Government through a federal highway commission, has been introduced in Congress. Secretary Houston of the Department of Agriculture has opposed the measure as impracticable and unnecessary, claiming that the existing machinery is satisfactory for the administering of federal aid. His arguments, which were embodied in a statement replying to a letter received from a chamber of commerce, were printed in "Good Roads" for May 24.

Henry G. Shirley, Secretary of the Highway Industries Association, who was formerly state highway engineer of Maryland, has recently issued a statement that the proposed measure does not in any way interfere with the cooperative plan provided for by the present federal aid law and strongly indorsing the Townsend measure. The statement follows:

"The National Highway Bill is entirely a new piece of legislation. Its object is to build in each state trunk line highways to the extent of not less than 2%, nor more than 5% of the total mileage of the state, and to join them up with the main trunk lines of other states so as to make a complete national system connecting the entire country. It creates a system of national highways, independent of the states, and highways that will carry interstate traffic and that are necessary for the welfare of the country as a whole.

"Under the present Federal Aid Law the Federal Government has no power to select the roads in any one state that will be improved. The initiative is with the state highway departments, and in many instances is really with the counties themselves, who have to put up the state's portion of the money.

"The only limitations prescribed by the federal aid law are that the roads shall be rural post roads. When a road has met this condition, it is the duty of the Secretary of Agriculture to give his approval to its construction. All federal aid projects start with the 48 different state highway departments, and such projects are considered in 48 different lights, by 48 different men, holding 48 opinions, and it can be seen that a national plan that would evolve from such a procedure would be most chaotic, to say the least. It is also impossible under the federal aid law to so coordinate the 48 state systems that a plan would be finally evolved that would form a connected system throughout the country in a lifetime.

"The personnel of the state highway departments is constantly changing, and in a more or less degree the state highway systems are changed with the changing of the state highway officials. It is, therefore, out of the question to expect any connected system of roads between the 48 units over which there is no supervisory power or anyone with authority to bring these 48 units into accord or to direct them in improving those roads that would form a national system.

"Many of the states have laid out systems of state highways. A number of these highways are designated by law and have been laid down by the legislatures, and are not always the roads recommended by the state highway departments. Even these roads are being constantly changed at each meeting of the legislatures, so that the system as now laid down will not be the system as finally constructed. Many of the roads, as laid out in the state systems, on which federal aid is being expended, should not and never will be classified as national highways, but they constitute a large portion of the mileage of the plans that have been approved as a general state system, and on which there has already been granted federal aid.

"It will take many years to complete these state systems under the federal aid allotment, and at the present rate of construction it will be at least 50 years before there will be connected a few roads in all the states approaching a national system, and at least 100 years before the entire state systems have been completed and built up so as to form a general system of roads from which a reasonable national system could be established.

"We have seen the road work of the country expand from the township unit into the county unit; from the county unit into the state aid unit; from the state aid unit to the state unit; from the state unit to the federal aid unit, and it is but logical and reasonable that the final step should be taken by establishing a federal unit.

Many of the highway activities of the states, when they first entered into road construction, were in cooperation with the agricultural departments of the states or agricultural colleges, but it was soon found by experience that, as this work expanded and grew, it became so important that it was necessary to provide an independent unit of the state government, whose duty it would be to lock after this one important development of the state. Likewise, the day has come when the road work of the Federal Government should be separated from the Agricultural Department of the Government and put into the hands of a strong commission, who will devote its time and energy to this most important work of the nation and place it in the position it should occupy to be of the most benefit to the people.

"The advocates of good roads are only asking in this national highway bill that the roads be put on an equal footing with the other departments of the Government, so that they can be given proper consideration and study, for there is no other pursuit of the Federal Government that will develop and bring prosperity to the country to a greater extent, for the money invested, than the speedy improvement of its important highways."

Road Oiling in Pennsylvania

Rapid Progress Being Made in the Application of 5,000,000 Gallons of Road Oil by the State Highway Department

The Pennsylvania State Highway Department announced last week that of the 5,000,000 gal. of oil which it is proposed to apply to the highways of the state during the present season, over one-third has already been put on.

Although the quantity of oil to be applied during 1919 equals that used in both 1916 and 1917, the department is far ahead of its previous records. At present about 30 trucks are at work in various sections of the state, and it is expected that by Aug. 15 the oiling operations will have been completed.

During last week oil was applied on various sections of the Lincoln Highway between Philadelphia and Pittsburgh, and also in the following counties: Adams, Berks, Bucks, Butler, Center, Chester, Columbia, Delaware, Elk, Fayette Forest, Huntingdon, Lancaster, Lebanon, Lehigh, Luzerne, Mercer, Monroe, Montgomery, Northampton, Northumberland, Potter, Washington, Wayne and Westmoreland.

◆

Revised Estimates for Road Improvement in Niagara County, New York, call for the expenditure of $306,301.34. These estimates, prepared by County Superintendent Thomas N. Brennen, call for one of the largest road building programs in the history of the county, the work to be done having a total length of about 13 mi.

HIGHWAY TRANSPORTATION

Army Truck Train to Cross Continent

Largest Motor Transport Train Ever Assembled to Start Transcontinental Trip on July 7

The largest motor truck train ever assembled will leave Washington on Monday, July 7, for a transcontinental trip, ending in San Francisco. The train, operated by the Motor Transport Corps of the Army, will follow the Lincoln Highway so far as possible, and is expected to complete the journey in 60 days.

According to recent advices the train will consist of 5 passenger cars, 35 army trucks, 2 ambulances, 2 tank trucks, 2 kitchen trailers, several motorcycles, a shop truck and a number of other special units. The entire trip is to be made on a war basis, depending upon outside supplies and service only for gasoline, oil and water. All repairs, adjustments and replacements are to be made by the personnel of the train with their own facilities.

The purposes of the trip include tests of the various transport units, the training of officers and men, the procurement of recruits for the corps and a demonstration of the possibilities of long-distance motor transport.

Routing Motor Truck Deliveries

Determining Routes To Be Followed and Preparing Schedules One of Chief Problems of Truck Operators

One of the problems which truck operators must face and one which has a very great influence upon the profits of their business, is that of effective routing and careful preparation of schedules, according to an official of the B. F. Goodrich Rubber Co.

The truck operator should first fix definitely in mind that the zone is the basis of the delivery system, he says. With zones correctly fixed the delivery system based upon them will undoubtedly work successfully. Without fixed zones it will be impossible for the truck dispatcher to figure the probable time of deliveries and it will be difficult to figure delivery costs.

"The first step in planning an efficient delivery zone," the statement continues, "is to secure a map of the territory covered. This map should be sufficiently large in scale to plainly designate all streets, roads, bridges, docks and ferries. It should hang in plain sight of every one connected with the delivery system, including order fillers, dispatchers, loaders and drivers. It should be studied with thoughts of everlastingly seeking new routes. Weeks and probably several months may be consumed before a satisfactory zone of delivery is laid out. Time required to establish a system is well spent, for a well designated delivery route is as valuable as the truck that travels it. The route should be well balanced, serve the maximum number of customers with the least idle time, make use of the shortest cuts, traverse the best pavements, and avoid covering the same ground twice.

"After a careful study of the city map has been made the question of time analysis must be solved. Distance of trips is learned from the map, but time scheduling of trips is developed by experiments. The time study of the map measures idle time, loading time and time made in stops. After dependable figures on time to cover a given route, or the time distance between important points on a given route, have been acquired, the operator is in a position to do further planning and arranging of his zones to increase their effectiveness.

"Among other elements entering into scheduling truck transportation is making the schedules dovetail with those of trains, ferries, and so forth, whose schedules cannot be changed. The same problem may be met by a study of street traffic by getting data on the time of street and bridge congestion.

"Probably one of the biggest money saving ideas adopted by truck operators is the sub-station, or depot for rehandling of orders. Large trucks carrying enormous loads of bundles go from the store to the sub-station without a stop. There they leave their loads and return. Light, fast, and comparatively inexpensive delivery cars split up the load and deliver bundles from house to house.

The advantages of sub-station delivery are quickly obvious. One has merely to imagine an $800 delivery car and a $5,000 truck standing side by side to realize that it is costing less to deliver the parcel with the small truck, and that with hundreds of deliveries to be made, the difference in cost is quite pronounced. In many cases the sub-station may also be used as a garage.

"The routing and planning of a delivery wagon system is similar in many ways to the problems of the railroad builder. 'Tracks' must be laid, over which the trucks must travel. Very few systems are perfect. New ideas and time-saving methods are continually presenting themselves to the open-minded, progressive motor truck operator."

Truck Manufacturers Build Trailers

Leading Makers of Trucks Produce Special Models for Hauling Trailers and Semi-Trailers

The economy and advantages of trailers and semi-trailers in certain lines of highway transportation has appealed so strongly to many well known motor truck manufacturers that they are putting out special machines for hauling trailers, according to a recent statement from the Trailer Manufacturers' Association. Among the companies which are cited by the statement are the Pierce-Arrow Motor Car Co., the International Motor Co., the Garford Motor Truck Co., the General Motors Truck Co., the Locomobile Company of America, the Sterling Motor Truck Co., the Gramm-Bernstein Co., the Indiana Truck Corp., the Service Motor Truck Co., the J. C. Wilson Co., the Acme Motor Truck Co., the Winther Motor Truck Co., Master Trucks, Inc., the Fulton Motor Truck Co., the O. Armleder Co., the Moreland Motor Truck Co., the H. J. Koehler Motors Corp., the Day-Elder Motors Corp., and the Oneida Motor Truck Co. Other companies, including the Kelly-Springfield Motor Truck Co., the Lewis-Hall Iron Works, the Maccar Truck Co., and the Dart Truck and Tractor Corp., also build tractors on special order.

Nearly all truck manufacturers who do not build tractors recommend the use of trailers with their regular short wheel base trucks whenever the character of the customer's haulage work and the condition of the highways made it certain that trailers should be used, according to the statement. The tractor trucks are designed especially for draft work, having very short wheel bases, extra strong frames, heavier axles, wheels and springs, larger tires, lower gear ratios and special equipment for hitching the trailer. These facts, it is stated, were developed by an investigation recently carried out by the association. The statement continues:

"A considerable number of truck companies employ transportation engineers who have made a special study of all phases of haulage and whose duty it is to analyze the customer's requirements and recommend the particular equipment best suited to meet them. By calling such experts into consultation the prospective purchaser of haulage equipment finds a solution for the most difficult transportation problems, and avoids costly mistakes such as the purchase of trucks that are too large, more trucks than are needed, trucks not well adapted to his needs, or trucks that would have to stand idle for several hours in the working day while loading or unloading.

"As it is to the best interest of the truck manufacturer to deal honestly with the customer and sell him only such equipment as will give him the most satisfactory service, the transportation engineer recommends the use of tractors and trailers when his analysis of the requirements and operating conditions shows that they will be most efficient and economical.

"The use of trailers enables the truck owners to greatly increase the capacity of his truck at a very slight additional expense and in many cases makes truck operation economical where otherwise it might not compete successfully with haulage by team.

"On good, hard roads with moderate grades, almost any good truck has sufficient excess or reserve power to haul, in addition to its own capacity load, a trailer with an equal load, or by the substitution of a fifth wheel for the truck body, to haul a load of double or triple its rated capacity with a semi-trailer, or two-wheeled trailer. In the latter case, half the load is carried on the rear of the truck and the other half on the trailer wheels.

"The fifth wheel is attached to the truck frame directly over the rear axle and supports the front end of a semi-trailer. It permits an up and down rocking motion and commonly is provided with springs to take up the shock of starting the semi-trailer with its load.

"The fifth-wheel trailer provides the most economical and convenient means of transporting excessively long timbers, poles, pipes, stage scenery, derricks, etc., or unusually heavy articles, such as steam boilers and engines, structural beams, stone columns, etc.

"When four-wheeled trailers are to be used with their regular truck models, many manufacturers make certain changes in construction, such as strengthening the rear end of the frame, attaching a pintle hook or building in a spring draw-bar to connect the trailer, and reducing the gear ratios so the truck will travel at lower speed and have more pulling power. Other truck makers, however, have found that such changes are not necessary with their models."

More Companies Join Trailer Manufacturers Association

During the past month three more manufacturers of trailers have joined the Trailer Manufacturers Association which, as noted in previous issues of "Good Roads," was organized last March and opened headquarters in New York City on May 1.

The new companies are the Southern Motor Manufacturing Association, of Houston, Texas; the William G. Hesse & Son Mfg. Co., of Leavenworth, Kan., and the Los Angeles Trailer Co., of Los Angeles, Cal.

The association now has members in Massachusetts, New York, Pennsylvania, Ohio, Michigan, Wisconsin, Kansas, Texas and California.

Farmers will purchase 50% of this year's production of motor trucks, according to W. L. Kissel, Secretary and Treasurer of the Kissel Motor Car Co. He says that of the motor trucks produced in 1918, the farmers bought 34%, while 27% were shipped overseas.

Plans for the promotion of motor touring in California are being made by a large hotel syndicate, according to reports from Los Angeles. It is proposed to establish a series of inns along the state highway traversing the state north and south along the route followed by the padres, who, over a century ago, established the chain of missions that has since become famous. The syndicate plans to put up hotels that will provide clean rooms and well cooked food at moderate prices in order to cater to those who do not care to patronize the more pretentious tourist hotels.

PUBLICATIONS

AMERICAN ROAD BUILDERS' ASSOCIATION. Proceedings of the 15th annual convention, held at St. Louis, Mo., Feb. 4, 5, 6 and 7, 1918. Paper, 5¾x8¾ in., 271 pages and covers. Published by the American Road Builders' Association, 150 Nassau St., New York, N. Y. $2.00.

This report contains the papers presented at the St. Louis convention of the Association with a verbatim report of the discussions on the papers; the addresses of welcome and responses at the opening session; a list of exhibitors and lists of officers for 1916-1917 and 1917-1918.

MICHIGAN, MARQUETTE, CITY OF. Report for the year ending Dec. 31, 1919. Paper 6x8¾ in., 119 pages and covers, illustrated.

These reports include those of the commission government and its various branches among which are the Department of Public Affairs, the Department of Accounts and Finances, the Department of Public Works, the Department of Public Health and Safety, the Department of Light and Power and the Department of Water. It is profusely illustrated by views of public buildings and streets and by views in the parks and the country in the vicinity of the city. The illustrations are nearly all full page halftones of excellent quality, printed on heavy white paper.

"ILLINOIS HIGHWAY IMPROVEMENT BLUE BOOK, Facts, Personnel, and Full Data on the Successful Campaign for the $60,000,000 Bond Issue." Compiled from official information contained in the files of the Illinois Highway Improvement Association. Paper or cloth, 6x9 in., 136 pages and covers. Published by the Illinois Highway Improvement Association, Hotel La Salle, Chicago, Ill. $1.00.

This book, as its sub-title indicates, is largely devoted to the story of the campaign which resulted in the referendum providing for a state bond issue of $60,000,000 for the construction of highways. It is described further as "A reference for Illinois highway officials and a guide for other states that desire a copy of 'The Illinois Plan.'" Its contents include a history of the Illinois Highway Improvement Association and its work; the text of the law; a description of the routes which it is proposed to build; rosters of the state, county, and township officials of Illinois; and other data. The illustrations consist principally of portraits of members of the association and others who were active in the bond issue campaign.

MEETINGS

Calendar of Coming Meetings

July 4-5.—Texas Good Roads Association.—Annual meeting, Corpus Christi, Tex. Secretary, D. E. Colp, Austin, Tex.

Nov. 12-14—American Society of Municipal Improvements.—Annual convention, New Orleans, La. Secretary, Charles Carroll Brown, 304 East Walnut St., Bloomington, Ill.

West Virginia Good Roads Association

The West Virginia Good Roads Association was organized at a meeting held at Parkersburg, W. Va., on June 19. Officers were elected as follows:

President, H. R. Wylie, Huntington; First Vice President, Maj. C. D. Fortney, Chairman of the West Virginia State Highway Commission; Second Vice President, Col. W. J. Claren, of Welch; Third Vice President, Former State Highway Commissioner A. D. Williams, of Parkersburg; Fourth Vice President, Samuel B. Montgomery, of Kingwood; Fifth Vice President, Gray Silver, of Martinsburg.

PERSONAL MENTION

J. F. Witt has resigned as county engineer of Dallas County, Texas.

Charles C. Cook has resigned as city engineer of Wheeling, W. Va.

A. R. Towse has been elected county engineer of Escambia County, Florida.

C. W. Cross, Highway Engineer, United States Bureau of Public Roads, has been assigned to the Ogden, Utah, branch of District No. 2.

W. O. Price, formerly county engineer of Marion County, Iowa, has been appointed district engineer of the Iowa State Highway Commission, with headquarters at Chariton.

H. A. Marshall has resigned as acting road engineer of the Kansas State Highway Commission to become chief engineer of the South Western Engineering Co., of Hutchinson, Kan.

I. J. Eidman has resigned as assistant bridge engineer in the Kansas State Highway Commission to become bridge engineer for the South Western Engineering Co., of Hutchinson, Kan.

H. A. Sewell, formerly county engineer of Pend O'Reille County, Washington, has been appointed engineer of the Panhandle Highway District of Idaho. Mr. Sewell's headquarters will be at Spirit Lake.

George A. Duren, former State Highway Engineer of Texas, has been appointed highway engineer for Ellis County, Tex., where road improvement is to be undertaken with funds from an $850,000 bond issue.

Julius K. Munroe has been appointed state road commissioner of West Virginia, succeeding T. S. Scanlon, resigned. Mr. Munroe was formerly in the engineering department of the Morgantown & Kingwood Ry.

T. S. Scanlon has resigned as state road commissioner of West Virginia.

Geary Kimball, Highway Engineer, United States Bureau of Public Roads, has been assigned to the Ogden, Utah branch of District No. 2.

Capt. Levant Brown has been discharged from the Engineers and has been appointed senior highway engineer of the Bureau of Public Roads, with headquarters at the San Francisco office. Before entering the army, Capt. Brown was with the Philippine Bureau of Public Works as constructing engineer.

O. S. Tweedy has resigned as vice president of the L. A. Young Industries, Inc., Detroit, Mich., to become vice president of the Dryden Rubber Co., of Chicago, Ill. Mr. Tweedy has been prominently identified with the tire industry for about twenty years, formerly with the Diamond Rubber Co., and for about 10 years recently with the United States Tire Co.

EQUIPMENT–TRADE–MATERIALS

Chain Belt Officials on Foreign Business Conditions

C. R. Messinger, Vice President of the Chain Belt Co., of Milwaukee, Wis., who has recently returned from a three months' investigation of business conditions in Europe, believes that the United States will get the bulk of European trade after business conditions become normal.

"At present," according to Mr. Messinger, "European business is marking time and the general feeling seems to be that even the signing of the peace terms will not bring about any great change immediately. When things do open up, however, American manufacturers will be found in better shape than their European competitors and should get the bulk of the business, though liberal credit terms will be necessary."

C. L. Pfeifer, the treasurer of the company, has just returned from a several weeks' trip to Cuba, where he arranged for the extension of the company's representation and made a general study of business conditions. He says that Cuban business is in a very prosperous condition and the indications are that this will continue for perhaps two or three years.

"The Atlantic Line" is the title of a catalogue, designated as No. 19A, recently issued by the Harold L. Bond Co., of Boston, Mass. The catalogue is 6x9 in. in sizes and consists of 32 pages and covers. It is devoted to a description of "Atlantic" gasoline pumping and hoisting engines, hoists and diaphragm pumps. It is fully illustrated and particularly well printed.

The Good Roads Machinery Co., of Kennett Square, Penn., has announced the opening of a selling office in Chicago, Ill. Since the company was organized in 1898, it has maintained a sales office at Fort Wayne, Ind., but has never had an office at Chicago. The Fort Wayne office will be continued for the present, at least on a small scale, but the Chicago office will be the main selling office for the Western territory. The office was opened on July 1, in room 1203, Tower Bldg., Michigan Blvd. and Madison St. It is in charge of D. L. Philips, formerly manager of the Boston office of the company.

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GOOD ROADS

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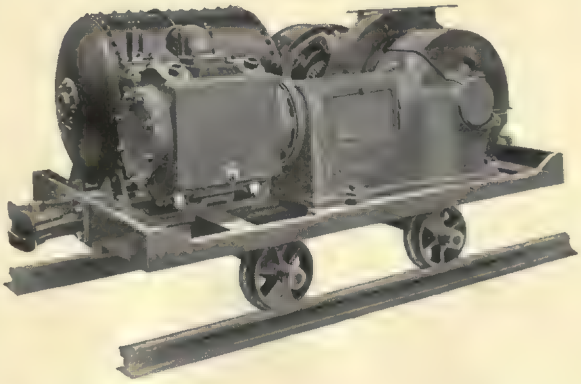

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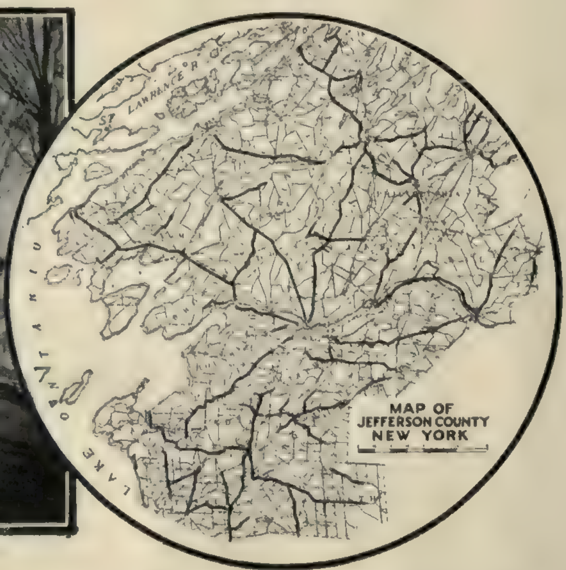

Tarvia

Preserves Roads-Prevents Dust

The illustration on the left pictures one of the Tarviated roads of Jefferson County, N. Y. The black lines on the map show the remarkable mileage of Tarvia roads in Jefferson County, N. Y.

—in Jefferson County, N. Y.

JEFFERSON County is solving the problem of low-cost, durable roads by the use of Tarvia and by co-operative action between the town and county authorities.

The towns provide machinery, tools, materials and labor. The county provides and applies the Tarvia. In addition, it makes a substantial money grant toward the cost of the improved road.

Maintenance costs of the new roads are adjusted on a "fifty-fifty" basis that is entirely satisfactory to both parties.

By this means, in less than three years 166 miles of modern, dustless, mudless, easy-traction Tarvia roads have been completed in this one county alone. These roads are water-proof, frost-proof and automobile-proof.

Mr. Henry S. Ball, County Superintendent, says these Tarvia roads "are in better shape today than when they were first built," and he sees "no reason why they should not last indefinitely." Mr. Ball is right because his experience is in line with that of users of Tarvia in every part of the country.

Doubtless this co-operative plan will be of interest to other highway authorities. If so we will gladly send full details on request.

Special Service Department

This company has a corps of trained engineers and chemists who have given years of study to modern road problems. The advice of these men may be had for the asking by any one interested. If you will write to the nearest office regarding road problems and conditions in your vicinity, the matter will have prompt attention.

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Carthage-Antwerp Road, Jefferson County, N. Y.—a Tarvia highway.

The Carthage-Watertown Road—another Tarviated highway.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVI.
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NEW YORK, JULY 9, 1919

Number
2

Surveying for Highway Improvement*

Future Usefulness of Roads Dependent Upon Painstaking Preliminary Work—Importance of Location—Cross-Sections

By F. G. PHILLIPS†

Today no house of any importance is built without a plan; so it should be with a road. You should have a definite plan and work by it. As the survey is to furnish the information for the design, it must be carefully made in regard to the essential features such as alignment, levels, cross-section, drainage, the character of the soil, the stone, sand, and water available, the amount and kind of traffic to be taken care of, the distance to railroad stations, etc.

The first thing to be considered is the location, and this should mean the selection of the most direct and practical route connecting two points—the line of least resistance, except places where some economical feature makes it necessary to vary from this line, always having in mind not only the first cost, but the cost of maintenance.

A road that is well located, even if poorly built, will stand as a monument to the engineer who made the location, for as property values increase the poor construction will be improved or the kind of surface changed, but the alignment and grades will never be changed.

On the other hand, a road may be well built and yet if it is not well located may become in a short time a very poor road. Then the public will demand that it be improved. And when the engineer attempts to improve it he will find that a new location is necessary, which may carry him so far from the original road that very little of it can be used. The county, therefore, not only will lose the cost of the

RELOCATED ROAD IN MONTROSE COUNTY, COLORADO—OLD ROAD AT RIGHT.

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*Paper presented at the 1919 "Road Builders' Week" of the University of Kentucky.

†Division Engineer, Kentucky Department of Public Roads.

first location and construction, but also the difference in the cost of construction on the poorer location and the cost of construction on the proper location.

I can show you where there was a half-mile of road built 15 years ago, over a hill on a 7½% grade, at a cost of $3,000. There was a survey made at the time around the hill with a 4½% grade, but the owner of the property refused to give the right of way and the commissioners did not want to hurt anyone's feelings by condemnation proceedings, so they built over the hill.

Three years ago this road was changed and built where it should have been built at first, increasing the distance only 200 ft. and costing a little less than $2,000. There the commissioners paid $1,000 too much for the construction and caused the traffic to go over that hill for 12 years, which cost thousands of dollars more; all of which might have been saved by paying for less than ½ acre of land.

Another thing that we find is that improvements will always follow on the new road even if it is badly located, and when these improvements have been made it is very difficult and in many instances almost impossible to change the location. Therefore I want to stress one point here and it is this: The importance of getting the proper location when making the first survey.

All of us, I expect, have been guilty of running a preliminary line hurriedly, keeping almost entirely with the old road, although we could see that the location was wrong, thinking we would correct this when we came back to make the final survey. But when we came to make the change and wanted to go through the field or cut off a corner, to make a decent curve, Mr. Farmer would say: "No! I gave the right of way with the understanding it was to be built where the stakes were set." Then, perhaps, after we have convinced him that it is absolutely necessary to make these changes to build a decent road, the county chairman comes along and tells us to be careful, "Esquire Jones is a good man (votes right) and he would like us to stay in the road here if possible. He is one of the big men of the court and we must not get him wrong." Then Esquire Jones stiffens up and says he thinks we are asking him to move too much fence; then we are up against it. If we dodge the orchard, the old crib, the pig pen and the wood-pile by making reverse curves, future generations will wonder why an engineer would make such a survey. The old crib has rotted down; Esquire Jones has gone; the pig pen is moved, and nothing is left to explain why, so the engineer gets all of the blame.

If the citizens would realize that the engineer has no personal interest in the location of the road other than to secure the best possible road for the money the county has to spend, and instead of following some selfish motive would do all they could to help build the best road possible, they would realize the advantages which they would gain by helping instead of retarding the progress of the good road movement.

Another point I would like to emphasize is the importance of making a thorough survey of the road that is to be rebuilt and resurfaced. Ten years ago it was thought it was only necessary to make a general line survey showing the existing grades and the width of the metal, take a cross-section occasionally, and report the condition of culverts and bridges. At that time macadam could be put on at $1.25 per cu. yd., and labor cost $1.00 per day, so that if the stone was put on a little heavy, it was not very expensive. But conditions have changed; labor and material cost two or three times as much now as then, and it is advisable to spend a little more in making the survey and find out exactly what is needed to make a certain class road, and use no more material than is absolutely necessary. And I would like to say here that the cost of the survey has not increased in proportion to the cost of material and labor—just why I would like some one in the discussion of this subject to tell us.

In 1916 I was asked to go over a certain road (in another state) which the commissioner thought was costing too much. The contract had been let for the reconstruction of 5 mi. of road; about 3 mi. of it had been done when we went over it. We found that there had been about 2,000 yd. of material wasted, and the only explanation we could find was that there had been a survey and profile made showing only the center line, and the engineer had laid the grade to make cuts and fills balance. His assistant went out and staked it in accordance with this profile, and as there were high banks—sometimes on both sides of the road—there was a great lot of material that was not needed in the fills. If the proper survey had been made, showing the cross-sections, the grade would have been laid differently and this waste of $600 could have been saved by the cost of the survey which would have been not more than $150.

Pennsylvania Contracts Awarded

Highway Department Awards Contracts for About 64 Miles of State Highways

State Highway Commissioner Sadler, of Pennsylvania, recently announced the awarding of contracts for about 64 mi. of state highways. The awards were as follows:

Chester County, Oxford Borough, Route 131, 2,932 ft., construction, the Juniata Co., Philadelphia, $21,601.50; Cumberland County, Upper Allen Township, Route 123, Section 1, 24,275 ft., reinforced concrete and hillside vitrified brick, the Langhorne Co., Inc., New York, N. Y., $181,604.95; Lancaster County Easton and West Hampfield Townships, Route 129, 37,684 ft., construction, Freeland Construction Co., Freeland, $247,272.96; Lycoming County, Piatt and Woodward Townships, Route 23, Section 1, 39,319 ft., reinforced construction, W. J. Gephart, Pittsburgh, $322,830.71; York County, Carrell and Franklin Townships, Route 123, Sections 1 and 2, 40,712 ft., construction, the Langhorne Co., New York, N. Y., $297,908; Blair County, Logan Township, State Highway Route 221, 23,075 ft., repair work, Eastern Paving Co. Philadelphia, $27,200; Blair County, Gaysport Borough, State Highway Route, 53, 890 ft., reinforced concrete, Standard Contracting Co., Altoona, $5,872; Bradford County, Athens Township, Route 287, Section 3, 6,640 ft., plain concrete, Valley Construction Co., Athens, $38,540; Cambria County, Jackson Township, Route 314, Section 1, 32,185 ft., reinforced concrete and hillside vitrified brick, the Nicola Building Co., Pittsburgh, $259,955.50; Centre County, Boggs Township, State Highway Routes 107 and 219, Section 1, 27,940 ft., construction, Vipond Construction Co., Altoona, $215,710.50; Crawford County, Woodcock and Hayfield Townships, Route 84, 9,067 ft., reinforced concrete, Keystone Construction Co., Meadville, $62,626.50; Erie County, Mill Creek and Fairview Townships, Route 84, 27,049 ft., construction, the Campbell Brothers Co., Youngstown, Ohio, $237,684.43; Erie County, Girard Borough and Girard Township, Route 86, 4,854 ft., bituminous surface course on concrete foundation and vitrified brick, Meyer Brothers Construction Co., Erie, $86,633.95; Erie County, Wayne Township, State Aid Application 839, 20,200 ft., reinforced concrete, the Highway Construction Co., Erie, $136,532.35; Mercer County, Grove City Borough, Route 73, 3,678 ft., construction Brackenridge Sand and Gravel Co. Brackenridge, $44,168.85; Potter County, Eulalia and Roulette Township, Route 101, Section 1, 26,400 ft., construction, Horn & Devling, Galeton, $215,048.17; Warren County, Youngsville Borough, Route 88, Section 3, 6,544 ft., reinforced concrete, Joseph McCormick & Bro., Erie, $39,906.50.

Proposed Tests and Specifications for Road Building Materials

Testing Methods and Specifications Recommended in the Report of Committee D-4 an Road Materials of the American Society for Testing Materials

(Concluded from July 2.)

Determination of Softening Point of Tar Products.

The method described in the committee report, it is stated, has been satisfactorily used in the tar industry for a number of years and the committee stated that it believed it advisable to adopt it specifically for tar products rather than to attempt to use the ring and ball method. The test was recommended for publication as tentative and was described in the committee report as follows:

1. (a) The softening of pitch takes place at no definite moment or temperature. As the temperature rises, pitch gradually and imperceptibly changes from a brittle or exceedingly thick and slow flowing material to a softer and less viscous liquid. For this reason the determination of the softening point must be made by a fixed, arbitrary and closely defined method if the results obtained are to be comparable.

(b) The methods herein described are not applicable to pitches having a melting point above 77° C. (170.6° F.).

(c) For the purpose of shortening the time required for testing, hard pitches having a softening point between 43° and 77°C. (109.4° and 170.6°F.) are cooled at 15.5°C. (60°F.) instead of at 4°C. (39.2°F.) as prescribed for soft pitches.

I. Apparatus.

2. The apparatus shall consist of the following:

(a) A mold suitable for forming a 12.7-mm. (½-in.) cube of pitch. (A recommended type is shown in Fig. 3.)

(b) An L-shaped right angled hook made of No. 12 B.&S. gage copper wire (diameter 2.05 mm.=0.0808 in.) the foot of which shall be 2.54 cm. (1 in.) long. See Fig. 3.

(c) A glass vessel, capable of being heated, not less than 11 cm. (4.33 in.) in diameter by 14 cm. (5.51 in.) deep. (A 600-cc. beaker, Griffin low form, meets this requirement.)

(d) A thermometer which shall conform to the following specifications:

Total length	370-400 mm.	(14.57 -15.75 in.)
Diameter	6.5-7.5 mm.	(0.256- 0.295 in.)
Bulb length	Not over 14 mm.	(Not over 0.55 in.)
Bulb diameter	4.5-5.5 mm.	(0.177- 0.217 in.)

The scale shall be engraved upon the stem of the thermometer, shall be clear cut and distinct, and shall run from 0° to 80°C. (32° to 176°F.) in 1/5°C. divisions. It shall commence not less than 7.5 cm. (2.95 in.) above the bottom of the bulb. The thermometer shall be furnished with an expansion chamber at the top and have a ring for attaching tags. It shall be made of a suitable quality of glass and be so annealed as not to change its reading under conditions of use. It shall be correct to 0.25°C. (0.45°F.) as determined by comparison at full immersion with a similar thermometer calibrated at full immersion by the United States Bureau of Standards.

II. Preparation of Sample.

3. The pitch shall be formed into a 12.7-mm. (½-in.) cube, truly shaped and with sharp edges, either by melting and pouring or softening and pressing, into a mold. In all cases an excess of pitch shall be used and the surplus material shall be cut off cleanly with a slightly heated knife. The harder pitches specified can ordinarily be molded at room temperature, the softer pitches in water at about 40°C. (39.2°F.). If they are melted, they should first be thoroughly stirred, avoiding incorporating air bubbles in the mass, and then poured into the mold so as to leave an excess on cooling. The mold should rest on a brass plate and the surface of the plate and the interior surfaces of the mold should be amalgamated to prevent the pitch from adhering to them.

III. Testing.

(A) Pitches Having Softening Points Between 43° and 77°C. (109.4° and 170.6°F.)

4. Assemble the apparatus as shown in Fig. 3. Fill the glass vessel to a depth of substantially 9.5 cm. (3.75 in.) with freshly boiled, distilled water at 15.5°C. (60°F.). Place the cube of pitch on the wire as shown in Fig. 3 and suspend it in the water so that its lower edge is exactly 2.54 cm. (1 in.) above the bottom of the glass vessel and its upper edge is 5.08 cm. (2 in.) below the surface of the water. Allow it to remain in the water for 15 minutes before applying heat. Suspend the thermometer so that the bottom of the bulb is level with the bottom edge of the cube of pitch and within 0.635 cm. (¼ in.), but not touching, the cube.

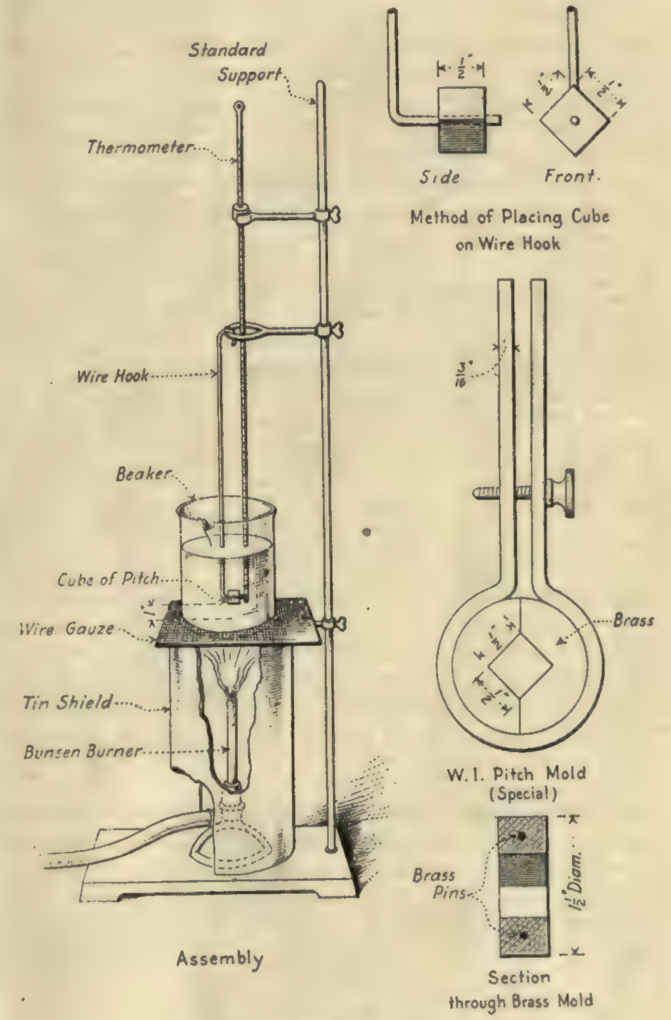


FIG. 3.

5. Apply the heat in such a manner that the temperature of the water is raised 5°C. (9°F.) each minute.

6. The temperature recorded by the thermometer at the instant the pitch touches the bottom of the glass vessel shall be reported as the softening point.

7. The rate of rise of temperature shall be uniform and shall not be averaged over the period of the test. The maximum permissible variation for any minute period after the first three shall be ±0.5°C. (0.9°F.). All tests in which the rate of rise in temperature exceeds these limits shall be rejected.

(B) Pitches Having Softening Points Below 43°C. (109.4°F.).

8. Use the same method as given under (A), except that the

(Continued on page 18.)

Construction Work in New York Last Year

Extracts from the Report of First Deputy Commissioner Breed on the Work of the Construction Department of the State Commission of Highways During the Year of 1918

With the armistice already fading into the background, it becomes necessary to emphasize that every bit of work done in this department during the year 1918 was conditioned, if not determined, by the war.

Shortage of labor and materials and difficulties of transportation surpassed our worst fears of 1917, and were intensified by the absorption from us into the service of trained and trusted men. A subtler, but no less real, cause of difficulty in prosecuting construction work was hypocrisy masking as patriotism. "Win the War at all Costs." Not the least ardent advocates of the slogan were those who sought personal profit from the war or, through it, opportunity to escape irksome obligations. Many unfinished contracts were one large question mark in this respect.

Despite these obstacles, progress was made and, aside from actual construction, two results attained which I hope may prove of permanent value in highway work.

Contracts were completed aggregating 363 mi. of road. The following tabulation reveals the present status of mileage under contract:

	Miles.	Miles.
On Jan. 1, 1918, there were contracts in force aggregating	....	1,111
Contracts awarded during 1918	....	000
Total under contract during 1918	....	1,111
Contracts completed and accepted during 1918	269	....
Contracts completed during 1918 but not in time for acceptance	94	363
Leaving under contract Jan. 1, 1919		748
On contracts in force Jan. 1, 1919, aggregating 748 mi., certain work has been performed as follows	....	748
Prior to Jan. 1, 1918	238	
During 1918	41	279
Leaving on Jan. 1, 1919, actual work to be performed under contracts in force	....	469

With consideration for the exigencies of the situation no attempt was made to place additional work under contract. Keen as was our desire to do so, you decreed and we realized that an honorable use of highway funds forbade the letting of contracts at prices so enormous as to preclude the possibility of a return in service by the road to the community—that in addition to the other insuperable obstacles already mentioned.

We concentrated our efforts, therefore, upon the completion of roads already under contract. Lettings were advertised for the completion of unfinished contracts. The returns were significant—from the bids received only five contracts, aggregating about 25 mi., could be awarded. Thereupon, under your authorization, we rallied our department forces to continue the work upon 15 other canceled contracts, aggregating 67.89 mi. Fourteen of these were handled directly by this office, and one, 1.3 mi. long, by a division engineer.

In every case where absolute completion of a road under process of construction was impossible, work upon it was directed so that it would best serve the convenience of the public.

The most important piece of work under construction is the Storm King Road between West Point and Cornwall, completing Route 3 along the west shore of the Hudson. We hoped to have that finished this year. The hindrances that have impeded us are too numerous and too intricate to detail here. At least, progress has been made past the point of these barriers, and there is no apparent reason why the road should not be in use by the end of another season.

The trend of the year's experience offers a suggestion and confirms a prophecy.

The unusual success of the department in doing its own construction work upon these unfinished contracts, despite the interminable coils of legal red tape twined about it, raises the question whether it might not be advantageous for highway departments to be authorized and prepared in emergencies to do their own construction as well as engineering work. As in our own case, plants could be hired or gradually acquired, and contractors engaged as superintendents. The arguments pro and con are lengthy; the idea is advanced now simply because it is in accord with that spirit of the age which is tending to centralize authority and to unify responsibility.

The use of the motor truck has exceeded all prophecies. The war has given it its place. It is a means of transportation coordinate with train and boat. Highways must be built to sustain it. In each of our three previous reports we have plead for the building of more durable types of pavement. We now have in this state 1,290 mi. of durable pavement of the concrete, brick, asphalt block, etc., types, as distinguished from the less durable water-bound macadams, etc. Henceforth, except in unusually isolated communities, the durable type will be the only economical type. The higher first cost of the former will be offset in a very few years by the higher maintenance cost of the latter under heavy traffic. There is no further excuse for building semi-durable pavements in or near settled districts. Their "cheapness" has, with the advent of the motor truck, become extravagance.

Research Work

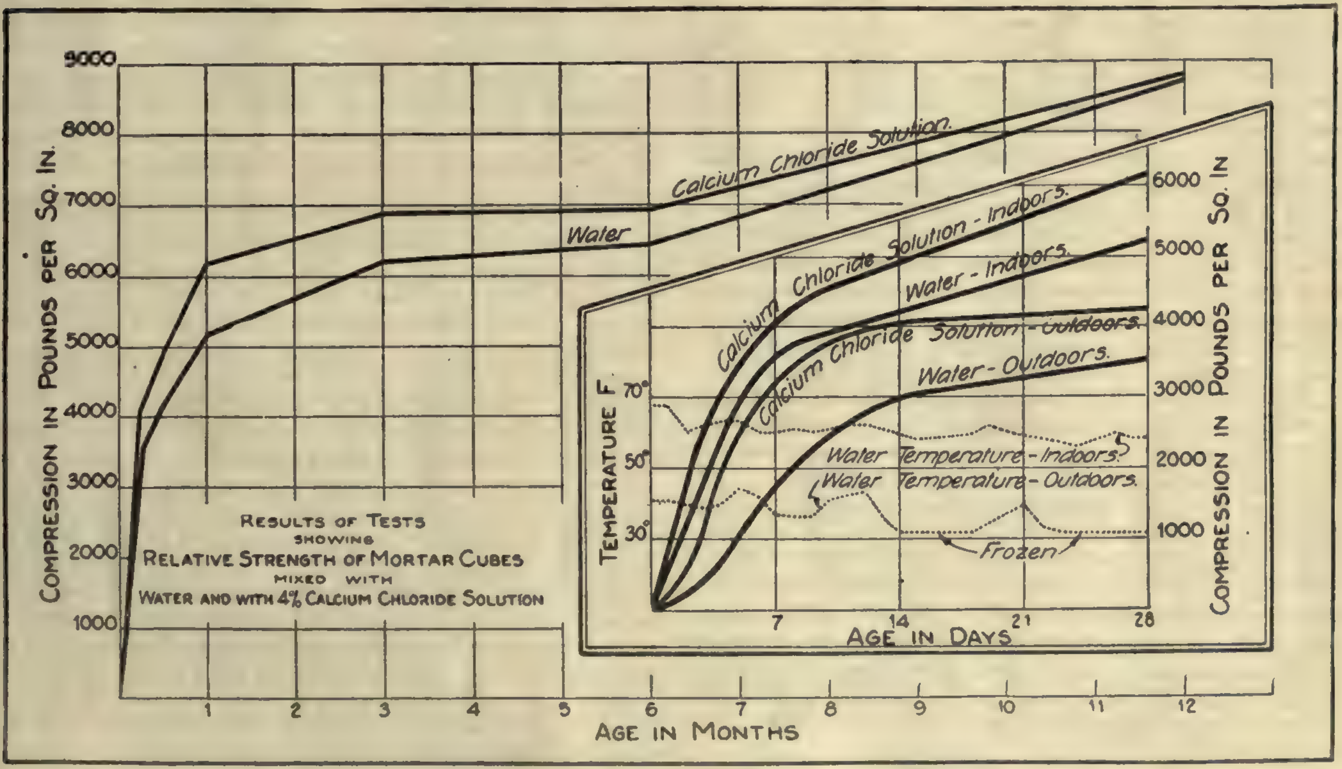
Perhaps the best contribution made this year by our department to the good roads movement was through our research work. A series of tests was completed to determine the advantages in use of calcium chloride solution to hasten the setting of cement concrete. It has been stated that by use of this solution concrete gun foundations could be put in use three days after construction. The tests made by this department were for the purpose of determining whether the rapid setting would decrease the ultimate strength which the concrete would attain. It is well known that abnormally quick setting cements do not usually make concrete which is as strong ultimately as the slower setting cements.

Laboratory test samples were prepared and tested at ages varying from one day to one year. The results are shown graphically herewith. They indicate that the use of a 4% solution of calcium chloride as mixing water for cement concrete increases the strength attained at all ages up to one year. Beyond that is still problematical, but what evidence we have indicates certainly no deterioration, and a probable continued, but slower, gain. The maximum increase appears to be about 20% at the age of one month.

The importance of this determination will be appreciated when it is considered that by the use of this solution it will be possible not only for the contractor, but also for the public to make use of cement concrete pavements a few days after they have been laid, without risk of damage. It will mean the completion of much work in the autumn which has hitherto had to wait over unfinished until spring. * * *

In the chemical laboratory experiments have been conducted to determine the feasibility of substituting available materials for some now almost unobtainable in the manufacture of bituminous patching compounds. It was found that light tar distillate could be substituted for petroleum naphtha as carrying agent in the composition of asphalt cut-back. A very satisfactory patching compound can be made in this way. The light tar oils are at present more available than petroleum naphtha and this condition we expect will prevail for several years. During the war the Federal Government required many gas companies, which had not previously collected light tar oils, to collect and conserve them. This action will greatly increase the supply and should make these distillates available at a low price. Our experiments enable us to take advantage of relative price fluctuations as well as of restrictions enforced by the Government at the time the experiments were conducted.

Experimental measurements of expansion and contraction of concrete in completed roads were continued. These show changes due to temperature and moisture under actual service conditions. They have been conducted to serve as a guide to determine the most desirable length of slabs and the kind and thickness of expansion joints best suited to this type of pavement.



RESULTS OF TESTS WITH CALCIUM CHLORIDE IN CONCRETE MIXTURES.

Bureau of Tests

The regular testing was carried out in the usual manner. The reduced amount of construction and repair work made necessary only about half as much work as had been handled under normal conditions. Some of the employees of this bureau were in the military service of the country and others were transferred to other work of the department.

Freight Rate Bureau

The unusual conditions existing during 1918 resulted in an almost total lack of new estimates for checking. The only work done in connection with quoting of material prices and freight rates for estimates was on special requests from the drafting room for use in bringing old estimates up to date. I therefore have no savings to report for this class of work as in prior years.

Before the beginning of the construction season it was arranged to check all freight bills against the Commission by this bureau. The items on which savings were effected are too numerous to justify detailed statement. The total saving, however, amounted to $579.31.

This checking brought to attention the fact that considerable shipments of crushed stone and sand were being moved on class rate. Reduced commodity rates were applied for and secured. Claims for reparation reducing class rate freight already paid to the new commodity rate basis have been made amounting to $794.00 and are now pending before the Railroad Administration. Another and much larger claim for reparation is also pending. This arises from the shipment of nearly 4,700 tons of sand and about 8,000 tons of crushed stone for a repair contract. Application was filed in April for reduced rates. Owing to confusion and uncertainty caused by changed methods under Government operation no action was taken until after shipments which were commenced in June had been completed. Class rates at 11 and 14 ct. per 100 lb. on sand and a rate of $1.40 per ton on stone were assessed. As result of the application, a rate of 8 ct. per 100 lb. on sand was later published, but no action has yet been taken on reduced rates for stone. Reparation of over $5,000 of the freight paid on sand and of over $2,000 of the freight paid on stone has been requested from the Railroad Administration. The matter is still pending, but it is believed that reparation will be made.

This bureau was able to affect materially the progress of both construction and repair work of the commission by expediting shipments. In many cases it traced shipments involving long hauls over several roads, obtained car supply for shippers and modified embargoes.

(Continued on page 22.)

Macadam and Gravel Road Maintenance[*]

Intelligent and Continuous Care Necessary to Conserve the Investment Represented by Highways Already Improved

By R. C. HEATH[†]

Before attending to handle a subject so broad and so difficult, it seems essential to describe in a general way the roads which comprise the present system of macadam and gravel roads in Kentucky.

The building of surfaced roads has been carried on in Kentucky for nearly a hundred years. The important main highways were practically all built either by the state or by the toll companies. The bulk of the road building within recent years has consisted of rebuilding and relocating these old highways to accommodate modern travel. It was, to say the least, unfortunate for the counties that the toll roads were freed and the automobile was made serviceable at about the same time. And, by the same token, it was certainly a bit of luck for the companies.

It is not out of place to bring out right here the point that the county officials are not to be too harshly blamed for failure to maintain the highways. Practically all the heaviest traveled highways were toll roads and the counties, therefore, had no need of spending much money or maintaining an organization for maintenance of the relatively lightly traveled roads which were under their care. When the roads were freed, new responsibilities were thrown upon the officials. A new vehicle terribly destructive to road surfaces was coming into use and no increased funds were given them to care for the roads; in fact, in most counties, the road fund has not been increased up to this day. The result of this situation is that Kentucky, one of the pioneers in good road building in the whole country, instead of reaping the benefits of the enlightened progressive policy of the past is actually handicapped to a greater extent than the states which are just commencing to build roads.

Many of the roads were poorly located when built, but the country has developed so much that any relocation is out of the question on account of expense and damage to private property. Large areas which were formerly heavily forested are now cleared and under cultivation. This condition makes necessary many additional drainage structures as well as increases in the size of old ones. The steep grades have become more objectionable because of increased damage by water. All these things heavily increase the costs of maintenance.

The problem of maintenance in Kentucky today is to keep the roads in a passable, usable condition until the people realize the true situation and will give their officials the money to put the roads in first-class shape. It is impossible, with the present funds available, to attempt to install an efficient, scientific maintenance organization, such as is operated in New York, Pennsylvania or Massachusetts. The average man has no idea of what it costs to keep the highways of the states mentioned above in good condition. I believe that the present system may be saved from serious damage for a time with the present funds, but the roads will not withstand the present traffic very long and will deteriorate rapidly as traffic increases. This discussion is intended to suggest methods by which the present funds may be expended to save the roads so that when money is available there will be something left upon which to build.

Water is the worst enemy of the highway in this state; even the automobile yields in destructiveness to the sudden heavy rains which often last for several days with no letup. The most important maintenance work is the opening of ditches to prevent water from crossing or running lengthwise of the road surface. In many cases, it would be economy to construct ditches just back of the tops of slopes in cuts to prevent filling of the roadside ditches. The excess material removed from the ditches should always be hauled away and not cast out on the slopes. This increases the cost, but is well worth the money. Every road should be ditched twice a year; late in the fall and early in the spring. It is essential that the ditches be straight and of uniform grade. Wherever possible, waterways should be cut to turn the water from the ditch. Culverts should be kept clean and the inlet and outlet ditches should be free from obstructions at all times. Very few highways have a sufficient number of culverts. Strictly speaking, building culverts is not maintenance, but the construction of a needed culvert frequently prevents serious damage to the road surface. Improving drainage is absolutely the first step in maintaining the highways and must take precedence over any other work.

Gravel roads in Kentucky have been built in almost every conceivable way, with and without specifications, rolled and travel-compacted, thin and thick, narrow and wide, and all kinds of materials have been used—bank gravel, creek gravel of every variety, river gravel and some material called gravel by courtesy only. The real secret of success with any gravel road is the ability to keep just enough moisture in the road. Too much water is no worse than too little. The surfaces of gravel roads can be kept in first-class condition under reasonable traffic by dragging. Dragging is an art in itself and requires excellent judgment. The road man must know from experience when the surface is in the right condition to drag, how much crown is best for the surfacing material, and above all must be willing to make several trips over the road rather than to try to get the result all at once. Slipshod or unskilled men mean wasted money and no results. More depends upon the execution of the work and the experience of the men than upon the methods used.

The roadway should be kept uniform in cross-section from ditch to ditch not only to prevent water damage, but also to distribute the travel so as to eliminate ruts. Concentrated travel on one section of the surface will soon wear out a gravel road. If gravel roads are well cared for they will withstand a great deal of steel-tired traffic. Automobile travel during the dry summer months when dragging is useless, and in fact harmful, will soon tear a gravel road to pieces. Many roads built of gravel are now being subjected to fairly heavy automobile traffic. It is out of the question to resurface with a higher type of road, because of the cost. Most of these roads are built where good stone is not locally available and in fact where gravel is almost the only material at hand. These roads, therefore, must continue as gravel roads for many years to come and must be subjected to an increasing automobile traffic. The problem is, then: How are they to be maintained until a more suitable road can be built? The only answer is "surface treatment." The kind of material to be used depends upon the character of the gravel, the local conditions and the funds available. Every road is a distinct problem in itself and no general recommendations should be made to cover all road conditions. The fact is evident, however, that the surface

(Continued on page 22.)

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[*] Paper presented at the 1919 "Road Builders' Week" of the University of Kentucky.

[†] Road Engineer, Kentucky Department of Public Roads.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
Editor

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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HIGHWAY SURVEYS

A very large part of the road builder's work consists of reconstruction, including not only the laying of new surfaces, but also, in most cases, the making of material changes in alignment and grade. In other words, most reconstruction involves also relocation.

This is necessitated by two primary causes, the first being the change in traffic during the years since many of the roads were built, and the second, the carelessness with which the original surveys were made.

In a paper presented at the 1919 "Road Builders' Week" of the University of Kentucky, F. G. Phillips, a division engineer of the Department of Public Roads of that state, calls attention to the necessity for careful surveys and points out some of the results of improper methods. The paper referred to is printed on other pages of this issue under the caption, "Surveying for Highway Improvement."

Every engineer who has done any locating or relocating knows the difficulties that are encountered. In most cases, the engineer is able to make a location that is entirely satisfactory from the engineering point of view, but too often this viewpoint is not the one from which final decision is made. By no means infrequently, the whims of owners of abutting property have to be taken into account, as do also, in some cases, political considerations that should be allowed to have no bearing whatever. In addition, the engineer is often limited to a location that can be followed without exceeding the funds allotted to that particular section of road.

These obstacles have always had to be overcome and probably always will have to be. Their existence, however, does not release the locating engineer from the responsibility of making the very best location possible and doing what he can to insure its adoption by those with whom the final decision must rest.

In this connection it is not out of place to call attention to one problem which every engineer—in fact almost every employee in a position of responsibility—has to solve, not once, but many times, in his work. That is the problem of how far to go in urging upon his superiors the course of action which he honestly believes to be right, but which he knows is not favored by them. An engineer in such a position realizes that his duty to his real employer—which is, of course, the public—demands that he shall do his best to bring about that action which he believes to be to the public interest. On the other hand, he faces the possibility of running contrary to his own interests by too great insistence upon a course which does not meet with the approval of his superiors.

Such circumstances as this ought not to exist, but unfortunately they do, and to every engineer they present a problem which he must always solve for himself.

SAFEGUARDING THE INVESTMENT IN IMPROVED ROADS

The improved highways of the country, though of small mileage compared with those which yet remain to be improved, represent an enormous investment and an investment which not infrequently in the past has been lost by failure to provide adequate maintenance.

A valuable discussion of this subject, with special application to macadam and gravel roads in the State of Kentucky, is printed on other pages of this issue in a paper presented at the 1919 "Road Builders' Week" of the University of Kentucky by R. C. Heath, Road Engineer of the Kentucky Department of Public Roads.

While Mr. Heath's paper refers specifically to roads of these two types, much of what it contains is equally true of roads of other types. At the same time, it is well to direct particular attention to the upkeep of macadam and gravel roads. In the first place, both are types that require constant care to avoid rapid deterioration that soon results in complete ruin. In the second place, while their value per mile is very much less than that of pavements such as asphalt, concrete, brick and stone block, their total mileage is so great that it makes their total value very high indeed. Another factor that adds importance to the whole problem of maintenance is the present condition of many of the highways. During the past two years labor costs have been inordinately high and labor has been hard to get at any price. In like manner, material prices have been above normal and it has been difficult, and in some cases impossible, to secure material or to get transportation for it. These and other causes incident to the war-time activity of the country have resulted in the neglect of highway maintenance, as well as in the more or less complete stoppage of construction and reconstruction. As a consequence, the roads in many parts of the country are today in worse condition than ever before.

In order to get these neglected roads back into condition and then to keep them there, it is going to be necessary to pay a great deal more attention to maintenance than has been paid to it in the past. This work is necessary not only in order to make the roads usable and thus yield a return on the investment represented by their cost, but also to prevent entire loss of that investment. Under present circumstances every transportation facility should be kept at its maximum efficiency, which means that the country's investment in highways is particularly well worth safeguarding.

For Better Roads in Iowa

Several Counties Take Advantage of Provisions of New Law and Vote to Undertake Hard-Surfacing

Four counties of Iowa—Blackhawk, Sioux, Palo Alto and Scott—have voted to undertake the hard-surfacing of their roads under the provisions of the new highway law. The Board of Supervisors of Benton County has voted to submit the matter to a special election in the near future.

Under the provisions of the new law, counties may undertake the hard-surfacing of the primary roads within their borders only after the voters have authorized such a step at a popular election.

Proposed Tests and Specifications for Road Building Materials

(Continued from page 18.)

water when placed in the glass vessel shall be at a temperature of 4°C. (39.2°F.). The cube shall be allowed to remain 15 minutes in this water before applying the heat.

IV. Accuracy.

9. The limit of accuracy of the test is ± 0.5° C. (0.9° F.).

V. Precautions.

10. The use of freshly distilled water is essential, as otherwise air bubbles may form on the cube and retard its sinking. Rigid adherence to the prescribed rate of heating is absolutely essential in order to secure accuracy of results.

A sheet of paper placed at the bottom of the glass vessel and conveniently weighted will prevent the pitch from sticking to the glass vessel, thereby saving considerable time and trouble in cleaning.

Specifications for Materials for Cement Grout Filler and Cement Mortar Beds for Brick, Stone Block and Wood Block Pavements, and for Granite Blocks for Granite Block Pavements.

The three specifications previously referred to as proposed by the committee follow:

Materials for Cement Grout Filler for Brick, Stone Block and Wood Block Pavements.

I. Sand for Cement Grout Filler.

1. The sand shall consist of clean, hard, durable stone particles, preferably siliceous, free from lumps of clay and objectionable foreign matter.

2. (a) The sand shall be well graded from coarse to fine and when tested by means of laboratory sieves shall meet the following requirements.

Total passing 10-mesh sieve	100%
Total passing 20-mesh sieve	not less than 80%
Total passing 200-mesh sieve	not more than 5%

(b) This test shall be made in accordance with the standard method for making a mechanical analysis of sand or other fine highway material, except for fine aggregates used in cement concrete (Serial Designation: D 7) of the American Society for Testing Materials.

3. (a) When the sand is mixed with Portland cement passing the requirements of the Standard Specifications and Tests for Portland Cement (Serial Designation: C. 9) of the American Society for Testing Materials, in the proportion of 1 part of cement to 3 parts of sand, by weight, according to the standard method of making 1:3 mortar briquettes, the resulting mortar at the age of 7 and 28 days shall have a tensile strength of at least 75% of that developed in the same time by mortar of the same consistency, made of 1 part of the same cement and 3 parts of Ottawa sand.

(b) Preliminary acceptance samples shall be subjected to both 7 and 28-day mortar tests, and acceptance based thereon. Samples tested during the progress of the work will be accepted on the basis of the 7-day test.

(c) The tests for mortar strength shall be made in accordance with the A. S. T. M. Standard Specifications and Tests for Portland Cement.

Note: The Portland cement used in testing the proposed sand should preferably be that used or to be used in the work.

4. The sand shall be subject to inspection after delivery at the place of use, prior to and during the laying of the pavement.

5. The sand shall be sampled for testing at the source of supply, if required. Samples shall also be taken for testing from time to time, at the place of use prior to and during the laying of the pavement, whenever desired by the engineer.

II. Portland Cement for Cement Grout Filler.

6. Portland cement for use in cement grout filler shall conform to the requirements of the A. S. T. M. Standard Specifications and Tests for Portland Cement (Serial Designation: C. 9).

III. Water for Cement Grout Filler.

7. Clean water free from harmful amounts of oil, acid, alkali, organic and vegetable matter shall be used.

Materials for Cement Mortar Bed for Brick, Stone Block and Wood Block Pavements.

I. Sand for Cement Mortar Cushion.

1. The sand shall consist of clean, hard, durable stone particles, preferably siliceous, free from lumps of clay and any objectionable foreign matter.

2. (a) The sand shall be well graded from coarse to fine and when tested by means of a laboratory sieve shall meet the following requirements:

Total passing 10-mesh sieve	100%

(b) This test shall be made in accordance with the Standard Method for Making Mechanical Analysis of Sand or Other Fine Highway Material, except for Fine Aggregates Used in Cement Concrete (Serial Designation: D. 7) of the American Society for Testing Materials.

3. (a) When the sand is mixed with Portland cement passing the requirements of the Standard Specifications and Tests for Portland Cement (Serial Designation: C 9) of the American Society for Testing Materials, in the proportion of 1 part of cement to 3 parts of sand, by weight, according to the standard method of making 1:3 mortar briquettes, the resulting mortar at the age of 7 and 28 days shall have a tensile strength of at least 75% of that developed in the same time by mortar of the same consistency, made of 1 part of the same cement and 3 parts of Ottawa sand.

(b) Preliminary acceptance samples shall be subjected to both 7 and 28-day mortar tests, and acceptance based thereon. Samples tested during the progress of the work will be accepted on the basis of the 7-day test.

(c) The tests for mortar strength shall be made in accordance with the A. S. T. M. Standard Specifications and Tests for Portland Cement.

Note: The Portland cement used in testing the proposed sand should preferably be that used or to be used in the work.

4. The sand shall be subject to inspection after delivery at the place of use, prior to and during the laying of the pavement.

5. The sand shall be sampled for testing at the source of supply, if required. Samples shall also be taken for testing from time to time, at the place of use prior to and during the laying of the pavement, whenever desired by the engineer.

II. Portland Cement for Cement Mortar Bed.

6. Portland cement for use in the cement mortar cushion shall conform to the requirements of the A. S. T. M. Standard Specifications and Tests for Portland Cement (Serial Designation: C 9).

Block for Granite Block Pavement.

1. The blocks shall be of granite of medium-size grain, showing an even distribution of constituent minerals. They shall be of uniform quality and texture throughout, and free from seams or disintegrated materials.

I. Physical Properties and Tests.

2. The average of three tests on sample blocks shall conform to the following requirements as to physical properties:

For Heavy Traffic.	
French coefficient of wear	not less than 11
Toughness	not less than 9
For Moderately Heavy Traffic.	
French coefficient of wear	not less than 8
Toughness	not less than 7

3. (a) The French coefficient of wear shall be determined in accordance with the Standard Test for Abrasion of Road Material (D 2), of the American Society for Testing Materials.

(b) The toughness shall be determined in accordance with the Standard Test for Toughness of Rock (D 3), of the American Society for Testing Materials.

Dimensions.

4. The blocks shall conform to the following requirements as to dimensions:

Length on top, in.	8 to12
Width on top, in.	3½ to 4½
Depth, in.	4¾ to 5¼

III. Dressing.

5. (a) The blocks shall be so dressed that the faces will be approximately rectangular in shape, and the ends and sides sufficiently smooth to permit the blocks to be laid with joints not exceeding ½ in. in width at the top, and for 1 in. downward therefrom, and not exceeding 1 in. in width at any other part of the joint.

(b) The wearing surface of the blocks shall show no depressions more than ⅜ in. deep, and the edges and corners shall be unchipped and unbroken.

IV. Inspection.

6. (a) At least six blocks shall be selected for physical tests by the engineer or his authorized representative, subsequent to delivery at the place of use, so as to fairly represent actual deliveries. No sample shall include blocks that would be rejected by visual examination. The bedding plane shall be marked on at least two of the blocks selected.

(b) All deliveries shall be subjected to further inspection at the place of use, prior to and during laying. All blocks which fail to conform to the requirements of Sections 1, 5 and 6 shall be rejected.

State Highway Bridges in Connecticut

Bridges of Over 25 ft. in Span Taken Over for Maintenance by the State

Under the law placing the responsibility for the maintenance of bridges over 25 ft. in span upon the state, three of the bridges spanning the Connecticut River are now under state maintenance. One of these, the bridge connecting Portland with Middletown, is a free bridge. The other two, one connecting Saybrook with Lyme, and the other connecting Haddam with East Haddam, are toll bridges. In addition to these there are bridges crossing the river at Thompsonville and Warehouse Point which are under control of Hartford County. The bridge connecting Hartford with East Hartford is controlled by a commission made up of representatives of the towns of Hartford, East Hartford, South Windsor, Manchester and Glastonbury.

The receipts for tolls at the Saybrook-Lyme Bridge last year amounted to $47,000 and were collected from 3,200 foot passengers, 114,000 automobiles, and 7,000 trucks. The receipts from the East Haddam Bridge amounted to $13,000, the money coming from 45,000 foot passengers, 21,000 automobiles and 6,000 trucks.

The law placing the maintenance of bridges more than 25 ft. in span upon the State Highway Department relieves the towns of the burden of caring for about 90 structures.

Road Bills in Congress

Over Forty Bills for Federal Aid Road Work Already Introduced at the Special Session of the 66th Congress

More than forty bills providing for federal expenditures for road building and for federal control of road work have already been introduced at the special session of the 66th Congress. Among the principal ones are the Townsend Bill, to which frequent reference has been made in "Good Roads," and the bill introduced by Representative Osborne of California, mention of which was made in the issue of June 28.

In comment upon the flood of bills introduced, the American Automobile Association has issued a brief resume of the most important measures. Some of these are noted below:

Senator Jones, of Washington, has introduced a bill for the creation of a department of public works which will take over all of the work now done by the Bureau of Public Roads, and Representative Reavis, of Nebraska, has introduced in the House a similar measure. Senator Sheppard, of Texas, is the author of a bill calling for a military highway along the southwestern border, and Representative Hayden, of Arizona, has introduced a bill calling upon the War Department to undertake a survey and investigation of the need for a boundary road. A somewhat similar bill has been introduced by Representative Hudspeth, of Texas. There have been introduced several other bills having for their object military roads, including one by Senator Jones, of Washington, calling for a survey of the entire Pacific Coast for that purpose, and the surveying and locating of a military post road from St. Louis, Mo., to Olympia, Wash.; one by Representative Lea, of California, proposing a military highway along the northern portion of the coast of California, to be known as the Roosevelt Highway; a similar bill by Representative Hawley, of Oregon, calling for the construction of the Roosevelt Highway along the Oregon Coast, and a bill by Senator Shields, of Tennessee, authorizing the Secretary of War to prepare preliminary plans for a system of national highways, with possible future military requirements in mind.

Representative Robison, of Kentucky, asked for an increase of $1,000,000,000 in the present federal aid appropriations, and Representative Ferris, of Oklahoma, asked for an increase of $400,000,000. Several bills from representatives of western states provide for the sale of public lands and the use of the proceeds for road improvement. one of the most important coming from Senator Phipps, of Colorado. In addition there are several bills calling for special appropriations to build military roads, memorial roads and roads in national parks. Delegate Kalanianaole, of Hawaii, asks that his territory be allowed to participate in the distribution of money provided by the Federal Aid Road Law.

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Gov. Davis, of Virginia, has set Aug. 15 as the date for the assembling of the special session of the Legislature for the consideration of matters connected with the acceptance of the federal aid road appropriation apportioned to the state. There is available to the state nearly $3,000,000 from federal funds.

The Pennsylvania State Highway Department has recently announced the amounts to be received by the various counties of Pennsylvania from the appropriations by the present Legislature for the cash tax bonus due townships for the years 1913 and 1914. The total amount for distribution is $1,142,049.38. The amounts due the various ing programs in the history of the county.

"The Open Road to a Greater America," a film prepared largely through the efforts of Windsor T. White, President of the White Co., to stimulate public interest in road improvement, is to be shown in moving picture theaters throughout the country. The film, which was produced by the Universal Film Co., was shown for the first time at the annual meeting of the National Highway Traffic Association on May 14, as was noted in "Good Roads" for May 7.

Pennsylvania Road Contractors are being urged to speed up their work, according to recent advices from the State Highway Department. During the past month a number of contractors were called into the department and advised that unless more rapid progress was made on their contracts, the contracts would be taken from them and the bonding companies held responsible. There is no reason why work on the state highways should not be expedited, according to Col. Wm. D. Uhler, Chief Engineer of the department.

Who's Who for Good Roads

Men Prominently Identified with Highway Development

From time to time we print on this page biographical sketches of the men who build the country's roads and the men who develop highway transportation—men who as a class are playing a most important part in the making of the nation. It is our hope that these brief sketches and the portraits will serve to bring closer together the earnest workers all over the country who are devoting their lives to this great work.

Paul D. Sargent

Chief Engineer, State Highway Commission, of Maine

Paul D. Sargent, Chief Engineer of the State Highway Commission of Maine, was born May 8, 1873, and graduated from the civil engineering course at the University of Maine, in 1896. Following graduation, Mr. Sargent spent two years in general municipal work, followed by one year in railroad construction work and five years in railroad maintenance work.

In 1905 he was appointed state highway commissioner of Maine and served in that capacity until 1911. In February of the latter year, he was appointed assistant director of the Office of Public Roads, United States Department of Agriculture, now the Bureau of Public Roads, and served there until August, 1913, when he returned to Maine to become chief engineer of the State Highway Commission.

PAUL D. SARGENT.

Mr. Sargent is vice president, for the Northeastern District, of the American Road Builders' Association; vice president of the American Association of State Highway Officials; a Director of the Federal Highway Council, and a member of the Rotary Committee of that organization.

Fred R. White

Chief Engineer, Iowa State Highway Commission

Fred R. White, who succeeds T. H. MacDonald as chief engineer of the Iowa State Highway Commission, was born on a farm near Selma, in Van Buren County, Iowa, May 21, 1884.

Mr. White's father was a farmer, and he was sent to the country schools in the vicinity of his residence and later graduated from the high school at Keosaqua. He entered the Iowa State College in 1903 and graduated from the civil engineering course in 1907.

After graduating, Mr. White secured employment with the Florida East Coast Railroad on concrete work on the Long Key Viaduct. He left this work to return to his home in Van Buren County when the undertaking was stopped in the panic of 1907-8.

FRED R. WHITE.

He commenced work for the Iowa State Highway Commission in 1908, on bridge construction, and had charge of work in Jefferson, Wapello, Cerro Gordo and Jasper Counties. In 1910 he left the State Highway Commission and entered the employ of the Morgan Engineering Co. and was engaged in drainage work for one year in Mississippi, Arkansas and Missouri. In 1911, when the Iowa Legislature appropriated sufficient funds to permit the enlargement of the State Highway Commission's activities, Mr. White returned to the Commission and served as field engineer until 1915, when he was made engineer of the road department.

H. Eltinge Breed

Former First Deputy Commissioner, New York State Commission of Highways

H. Eltinge Breed, First Deputy Commissioner of Highways of New York from 1915 until early in the present year, was born in Cornwall, N. Y., Apr. 23, 1877. He obtained his education at Trinity Chapel School, New York City, New York University and Colgate University. He graduated from Colgate in 1900, with the degree of B. of Sc., having specialized in engineering and chemistry.

H. E. BREED.

Mr. Breed spent a little more than a year after his graduation with the Newport News Ship Building & Dry Dock Co., at Newport News, Va., and then returned to New York, where he entered the Department of the State Engineer and Surveyor. He remained that until Jan. 1, 1909, passing through various civil service grades to that of assistant engineer. During this period he had active charge of some three million dollars' worth of work as well as of the preparation of plans and estimates. During 1909 and 1910 he was on Barge Canal work as auditor and on special engineering assignments. During 1911 he spent six months with the Highway Commission and then left to become assistant engineer on the Coleman du Pont Road, remaining there about a year.

Mr. Breed went abroad in 1912 and studied pavements in France, Belgium, Switzerland, Germany, England and Scotland. Upon returning to the United States he engaged in practice as a consulting engineer. In 1915 he was appointed first deputy commissioner of the New York State Highway Commission, in which position he acted as chief engineer on all new construction. One of the important pieces of work under his charge during this time was the Storm King Highway.

Mr. Breed is a past president of the American Road Builders' Association, and a member of the American Society of Civil Engineers, the Albany Society of Civil Engineers, the American Concrete Institute and the National Highway Traffic Association. He was a member of the Committee on Resolutions at the Second National Conference on Concrete Road Building, and one of the committee of five to prepare the recommended practice for that conference. He has also served as chairman of the Good Roads Committee of the Institute since 1917. This committee has recently finished a recommended practice which is largely the work of Chairman Breed. He has been a frequent contributor to technical publications, has delivered technical papers at a number of road conventions and engineering society meetings, and has been a lecturer at the Cornell Good Roads School and the Road School of the University of Michigan.

He is at present in private practice in New York City.

MEETINGS

Calendar of Coming Meetings

Aug. 6-8.—North Carolina Good Roads Association.—Annual convention, Wrightsville, Beach, Wilmington, N. C. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

Nov. 12-14—American Society of Municipal Improvements.—Annual convention, New Orleans, La. Secretary, Charles Carroll Brown, 304 East Walnut St., Bloomington, Ill.

Summer School of Community Leadership

The fifth annual session of the Summer School of Community Leadership, conducted by the American City Bureau, of New York, N. Y., will be held at Eagles Mere Park, Pa., July 14-25. Among the lectures scheduled are the following: "Essential Steps in City Planning," by J. Horace McFarland, President of the American Civic Association; "Finding More Money to Run the City," by Lawson Purdy, President of the National Municipal League; "City Planning for Industrial Development," by Perry R. MacNeille, engineer and town planner; "Securing Maximum Cooperation from City and County Officials," by Gaylord C. Cummin, formerly City Engineer of Dayton, Ohio; and "Highways in City and Country," by Arthur H. Blanchard, President of the American Road Builders' Association.

North Carolina Good Roads Association

The annual convention of the North Carolina Good Roads Association will be held at Wrightsville Beach, Wilmington, N. C., on Aug. 6, 7 and 8. The headquarters of the association will be at the Oceanic Hotel.

Among the topics to be discussed at the meeting are the construction and maintenance of state highways; the construction and maintenance of county highways, and administrative, construction and maintenance problems common to both state and county work. Under the subject of the construction and maintenance of state highways there will be taken up the following sub-topics: (1) A general property tax of 10 ct. on each $100 worth of property: (2) license fees on automobiles, based upon horse power, and upon trucks, based upon load capacity; (3) the issuing of bonds for the completion of the state highway system. The consideration of the construction and maintenance of county highways will include discussions on: (1) A general county road tax; (2) a tax on horse-drawn vehicles; (3) assessments upon the abutting property where the density of population and the valuation of property are sufficient to call for the more expensive types of pavements, such assessments to be used only to meet the cost of surfacing; and (4) bond issues for paying the cost of the permanent part of road construction. Under the general subject of construction and maintenance of both state and county highways there will be taken up convict labor, the patrol system, the hard-surfacing of all primary roads, greater uniformity in county legislation, state-wide enforcement of wide tire and similar laws, the organization of road forces, and the beautifying of highways.

American Society for Testing Materials

The 22d annual meeting of the American Society for Testing Materials was held at the Hotel Traymore at Atlantic City, N. J., on Tuesday, Wednesday, Thursday and Friday, June 24 to 27, inclusive.

The program as announced was followed very closely, the matters of special interest to road builders being those noted in "Good Roads" for May 10, including the report of Committee D-4 on Road Materials. Part of this report was printed in "Good Roads" for July 2 and the remainder appears on other pages of this issue.

During the meeting, the committee took up a number of matters in reference to its future work, and it is understood that an extensive program for next year has been prepared. Further announcements are expected shortly.

PERSONAL MENTION

Fred Hoffman, an engineer and contractor of Long Beach, Cal., has been appointed city engineer of that place.

Charles Semper, Highway Engineer, United States Bureau of Public Roads, has been assigned to the Ogden, Utah branch of District No. 2.

D. E. Gilmer, of Hutchinson, Kan., has been appointed superintendent of construction on federal aid road work in Reno County, Kansas.

Lieut. William L. Stanton has been discharged from the Engineers and has taken a position in the office of the city engineer at Flint, Mich.

W. R. Caldwell has resigned as city engineer of Ypsilanti, Mich., to become chief engineer of the Palma Construction Co., highway contractors, of that city.

Harry Conrad, of the firm of Coulter & Conrad, engineers, Wheeling, W. Va., has been appointed city engineer of that city, succeeding Charles C. Cook, resigned.

Capt. H. E. Darton, formerly of the 162d Depot Brigade, Camp Pike, and later first assistant state highway engineer of Arkansas, has been appointed state highway engineer.

William McGibbon has been appointed county engineer of Marion County, Iowa, succeeding W. O. Price. Mr. McGibbon was formerly with the Iowa State Highway Commission.

Maj. Theron M. Ripley has been discharged from the service and will return to his duties as division engineer of Division No. 3 of the New York State Commission of Highways.

W. J. Oviatt has been appointed city manager of Villisca, Iowa.

Fred W. Simons has resigned as city engineer of Rahway, N. J., to become city manager of Elizabeth, N. C.

Lieut.-Col. Elmer K. Hiles has just returned after nearly two years' service in France, and will join the Pittsburgh Testing Laboratory as manager of laboratories, with headquarters at Pittsburgh. Col. Hiles went to France as captain in the 15th Engineers.

Capt. Harry Tucker has been discharged from the Engineers and has been appointed associate professor of highway engineering at the State College of North Carolina. Capt. Tucker becomes acting head of the new department of highway engineering which has just been created as a sub-division of the civil engineering department.

Llewellyn N. Edwards has resigned as supervising engineer of bridges of the Department of Works, of Toronto, Ont., to become senior highway bridge engineer with the United States Bureau of Public Roads. Mr. Edwards has been with the engineering staff of the City of Toronto since 1913, previous to that having been in the bridge engineering departments of the Boston and Maine R. R., the Chicago & Northwestern Ry., and the Grand Trunk Ry.

Macadam and Gravel Road Maintenance

(Continued from page 16.)

must be held together by some kind of a surface treatment.

To save the gravel roads already built requires constant patrol by skilled men, study and experiment with different kinds of materials, and protection of the surface with the proper kinds of binders, when subjected to automobile travel.

The macadam roads in this state, like the gravel roads, have been built in many different ways and of varying grades of stone. The only road building rock in Kentucky is limestone, most of which is rather soft but possessed of high cementing value. This stone wears out quickly, but rarely does one see a road ravel. The water-bound macadam on roads in this state has withstood the automobile traffic wonderfully—if a hard stone had been used, the roads would have disintegrated very rapidly under such traffic. The cementing value of the stone is of great advantage in maintenance and this quality means a great saving on such work.

As a general proposition, there is plenty of material still in place on the old macadam pikes. Many of these roads were built with Telford foundations and investigation will show that those without this foundation have from 5 to 15 in. of metal in the roadbed. It is very seldom that one sees a pike where the surface has broken through the metal into the subgrade. The principal trouble with these roads is the poor cross-section and the rough, uneven surface with many pot-holes. By the use of a comparatively small amount of new metal for patching ruts and holes, and by surface treatment, these pikes can be made satisfactory for several years to come at much less than the cost of resurfacing. Great care must be exercised in selecting the material to be used on the surface and study must be made of the present traffic and its probable rate of increase.

The day is undoubtedly coming when higher types of roads must be built, but what Kentucky needs now is a larger mileage of surfaced roads rather than a smaller mileage of perfect highways. Unfortunately, there is not enough money available to rebuild all the old roads at once, and we must save these old pikes until we have the price of new ones. By means of careful patch-work, constant patrolling of the roads and surface treatment, it is possible and not too expensive to save the old roads. As money becomes available, resurfacing can be carried on and eventually everyone will have a good road right at his front door.

Maintenance is a new proposition in Kentucky and if it is to be a success, it must be handled right. The people will never allow the old pikes to disappear for lack of care and neither will they pay for resurfacing the same old road every three years. If the road officials will maintain the old roads and gradually extend the higher type of mileage as money becomes available, the people will become educated to the necessity of high cost roads, but it requires more than the mere say-so of a road engineer to convince the average taxpayer that he should vote for roads that cost $20,000 a mile. The best way to gain the confidence of the average citizen is to care for the old roads so well and so cheaply that he cannot help noticing it. Good maintenance is its own best advertisement. If given half a chance, the old roads can carry for some time to come many a wagon and many a truck or automobile.

Construction Work in New York Last Year

(Continued from page 15.)

General Office Work

Regular routine made necessary by the work in hand and in prospect was carried on as in former years. The amount was smaller on account of the reduced amount of construction in progress. The considerably reduced office force was able not only to accomplish the necessary regular work, but also to handle work normally done in our division offices. For example, from three of the division offices final estimates for contracts were submitted for preparation because the division engineers were unable to prepare them promptly on account of depleted forces. These final estimates must be rendered as basis for final payment on all contracts and the mass of detailed computations necessary for their preparation is so great that it consumes considerable time. In justice to contractors who are entitled to receive their money as soon as the amount can be accurately determined, it has been our endeavor to reduce delays to a minimum.

The year speaks more for endeavor than for achievement, although, considering the difficulties involved, actual accomplishment has not been slight. We have sought in every instance to secure the greatest convenience for the public; we have demonstrated that a highway department may successfully do its own construction work, and through our research work we have made two definite contributions to the science of road building. We wish that we might have done more, but in view of the war we bespeak leniency of judgment.

Work on the Henry Hudson Drive in the Palisades Interstate Park on the west bank of the Hudson River in the States of New Jersey and New York, has been resumed, according to a recent statement by G. W. Perkins, Chairman of the Palisades Interstate Park Commission. It is said that over $100,000 has recently been made available for continuing construction and that a large number of discharged soldiers are being employed. About $500,000 has already been expended on the project which, according to the plan, will consist of a drive from Englewood into the New Jersey section of the park along the cliffs to Alpine. This, with the Storm King Road, will furnish a through route between New York and Albany on the west side of the river.

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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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NEW YORK, JULY 16, 1919

Number 3

British Engineers' Reconstruction Problems[*]

Development of Labor Saving Machinery and Methods and Dealing with the Chief Problems of Municipal Engineers

By E. J. ELFORD[†]

At the close of the greatest war in history we find ourselves in a different world—a world battered and torn and impoverished—and faced with problems of reconstruction which might well make the bravest anxious and doubtful of the future. History has shown, however, over and over again that a Britisher is at his best when in a tight place, and the writer has faith to believe that when the gravity of the situation is fully realized ways will be found out of all difficulties. It is important to remember that to a great extent the whole world is passing through a period of transition, and that not only are we involved in problems of national, civic and industrial reconstruction, but also in world-wide problems. It may, in fact, be said that our whole outlook and mode of thought are undergoing a process of reconstruction, or, at any rate, readjustment. It is clear, therefore, that every individual must play some part, and that no one can escape being influenced by the changes that are taking place. Moreover, it is safe to say that unless we who hold important positions in the public service live up to our responsibilities, the community as a whole must suffer. It seems to the writer that the first requirement is a broad vision, and that even those whose interests appear to be of a local, almost parochial, character must in future cultivate a regional, national and even international outlook.

During the past five years we and other nations have been squandering life and wealth at a terrific rate, and prosperity can be regained only by great and united effort. On the other hand, there is an insistent and growing demand by the bulk of the population for a higher standard of living and more leisure, which, somehow or other, will have to be satisfied.

It is clear that the only way to meet these conditions is by increased efficiency, elimination of waste and an enormous increase in the productive capacity of human effort. It is also essential that every individual should realize the importance of reducing imports and increasing exports, and we, as local officials can assist in this direction by endeavoring to utilize home produced materials to the greatest possible extent.

It will probably be said that the writer is only stating what must be obvious to every thinking man, and what has already been said many times and very much better by others, but he is not aware that this point of view has been put directly before the members of the institution. In any event, it is so important that every section of the community should realize its vital interest in the subject, and its individual responsibility, that it cannot be repeated too often.

In every town the cost of public works has been rising by leaps and bounds, and there are few places where the rates are not considerably higher than in pre-war days. This is very largely the result of higher wages, but there are also other causes, such as unreasonable profits. Before the war the wage of unskilled laborers in Cardiff was 6½d. per hour, and the ordinary working week was 52 hours. Now the minimum rate is 1s. 3d. per hour for a 47-hour week. Personally, the writer is not afraid of high wages and short hours, if men will do their best whilst at work with both hands and head. History has shown that increased cost of labor has invariably stimulated invention, which has often had the effect of ultimately reducing the cost of production, notwithstanding the higher rate of wages. To some it may appear that progress in this direction is nearly exhausted, but the writer is optimistic enough to look for the invention of appliances and the introduction of methods for increasing the productiveness of human effort to a greater extent than any which have been produced in the past. As indicating the possibility, the writer would refer to promising results which have already been obtained from the application of electric energy to food production. * * *

The same considerations apply in a greater or less degree to practically all branches of work, and there is probably not one which would not benefit by thorough study and research on scientific lines. Certainly the various activities in which municipal engineers are engaged would be no exceptions in this respect. At the time war broke out a move was being made in the direction of the greater use of labor saving appliances for municipal work. War demands of the past five years practically put an end to this for the time being, but the conditions now operating are such as to render it more imperative than ever that every effort should be made to increase efficiency and reduce costs. The writer now proposes to suggest a few directions in which it should be possible to do this.

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[*] From a paper prepared for the meeting of the Institution of Municipal and County Engineers, Great Britain, at Cardiff, June 17, 1919. (From the "Journal of the Institution of Municipal and County Engineers.")

[†] City Engineer, Architect and Surveyor, Cardiff, Wales.

One of the most important, and, at the same time, most costly duties of a local authority is the collection and disposal of house refuse. In many cases the collection can be very much cheapened by the extended use of mechanical traction. In employing vehicles driven by steam or petrol engines, one of the main essentials to efficient working is to secure a reasonable daily mileage, and this is almost impossible when they are used in the ordinary way for house to house collection. The mileage factor must necessarily be small, which means intermittent working. In addition, the constant starting and stopping also reduce the efficiency. Electrically driven vehicles, however, are not affected to the same extent by these conditions, as energy is being consumed only when the vehicle is on the move, and in almost direct proportion to the work done. Moreover, they are simpler in construction and operation, and, consequently, less liable to get out of order, and can be managed by comparatively unskilled men. Under most conditions, therefore, where a self-contained motor vehicle is used for this class of work, the electric lorry appears to be the most efficient. The writer suggests, however, that in many towns, especially where the tip is a considerable distance from the point of collection, it would pay to collect from house to house by horses and arrange for the delivery of empty wagons and picking up and haulage to the tip of full wagons by small tractors. Such a system would require careful organization and supervision to prevent waste of time at the change-over points, but, from an experiment he made just before the war, he is satisfied that it has great possibilities. Wagon bodies which can be loaded from ground level would also reduce labor considerably. The writer is aware of the practical difficulties of doing this, but does not think they should be found insurmountable. If they are, he suggests the consideration of some simple form of loading apparatus attached to motor vehicles, so that the refuse could be tipped into a hopper from the road and loaded by mechanical power into the vehicle. Many motors used for municipal work are fitted with interchangeable bodies, but the methods adopted for changing over are often such as to involve much waste of time and labor. It is important that this should be prevented.

It is recognized that to obtain the best results from the use of motor vehicles, quicker loading and unloading must be provided. A power tipping body will give the latter, but quick loading is more difficult to arrange. To load a 5-ton lorry with macadam by hand would take three men, on the average about ½ hour, and assuming, say, four loads a day, means a cost for labor of probably 2s. a load, even if the men can be kept fully employed between the loads, which is seldom possible, and a loss of at least a load a day.

The writer is considering the provision of a simple portable elevator, in the hope that it may be possible to load a lorry in about five minutes.

Petrol motor sweeping machines are in use in a number of towns, and enable the carriageways to be cleaned more quickly and more economically than by horse-drawn machines. Efforts have been made to produce combined sweeping and collecting power-driven vehicles. The writer has been able to inspect several types of these machines, but has not yet seen one that appears to him to be fully satisfactory. They may be divided into two groups, viz., those which sweep and load into a separate vehicle, and those which sweep and load into a container forming part of the machine itself. Both types appear to be cumbersome and clumsy, and neither is capable of sweeping close up to the curb, where most of the dust accumulates. The latter type of machine involves a journey to tip each time the container if filled, and, as the capacity of this must necessarily be comparatively small, this is likely to result in much loss of time. Another disadvantage is that such a machine can be used for no other purpose, and would, therefore, be idle much of its time. The ideal apparatus would seem to be a light portable combined sweeper and elevator, capable of sweeping right up to the curb, and delivering into a separate vehicle, either motor-driven or horse-drawn. It might be desirable to make the apparatus self-contained by providing it with a small petrol motor for operating the broom and elevator. Hitherto, machines of this kind have had to rely for power upon the vehicle receiving the refuse, the power being transmitted through the road wheels. The writer suggests that, where the mileage of roads to be swept is considerable, the most economical course would be to sweep the refuse from the road into the channel by motor-driven sweepers and then pick it up and load it by means of the suggested combined sweeper and elevator.

A machine of the latter kind might be so constructed as to permit of the removal of the sweeping apparatus, so that the elevator might be used for other kinds of work.

Vacuum gulley cleaners are already used in large numbers, and effect a considerable saving in labor and expense where the street gullies are of a suitable pattern. During the war street watering has been reduced almost to a vanishing point, and, although it is desirable in the interests of public health that this should not continue, it is not likely to be carried out to the same extent as before the war. The introduction of road tarring, and of impervious road surfaces, has done much to reduce the dust nuisance, but it must be borne in mind that the dust now produced consists largely of decomposed organic matter which is particularly dangerous to health. The flushing of the channels and branches to a width of, say, 2 or 3 ft. from the curb is of much advantage from this point of view, and can be carried out quickly and economically by electric or other motor water vans fitted with side distributors.

Local authorities who execute much of this work by administration will, in most cases, find it of advantage to centralize the work of their various departments, and to provide or increase labor saving appliances, such as power-driven circular and band saws, lathes, drilling machines, smiths' hammers, chaff-cutters, planing machines, hoisting apparatus, etc.

Where natural stone paving is used in large quantities, it may be worth while to consider the installation of pneumatic stone dressers, and, in some cases, such as tramway works, a pneumatic tamping machine may be found advantageous.

Under present conditions it is not sufficient that members of the institution should be content to rely upon manufacturers to introduce improved apparatus, but they should endeavor to think things out for themselves, and devise new and improved methods.

The subject of road construction is also one which must be reviewed from new standpoints. The cost of wood paving is almost prohibitive. Granite setts are also high in price, but less costly than wood. The ordinary rough setts are, however, objectionable, being both noisy and destructive of rolling stock and horses. Although it is impossible to estimate the loss to the community resulting from this destructive effect, it is without doubt a very serious item in towns where setts are in general use. The writer suggests that this is a question which should not be overlooked by local authorities and that all such matters should be viewed from the standpoint of what is best for the community as a whole. If this attitude is adopted it will also mean that local, or at any rate, home produced materials will be used so far as practicable. It is partly for this reason that the writer has been seriously considering the adoption of concrete roads, and he has come to the conclusion that, given great care in the selection of materials and the execution of the work, they are likely to prove satisfactory and economical substitutes for wood, granite and asphalt paving. * * *

The labor question, which has assumed a new aspect since the beginning of the war, is one with which the members of the institution are deeply concerned. In dealing with this matter, tact, sympathy, an unprejudiced mind, common sense, and, above all, absolute good faith are necessary. It is generally agreed that the great obstacle to industrial peace and national prosperity is the atmosphere of distrust and suspicion which appears so general at the present time, and it is a patriotic duty of the members of this institution to do all in their power to restore mutual confidence. This is probably, after all, the most important and difficult national problem now awaiting solution, and is worthy of our best efforts.

The New State Road Law of Iowa*

Measure Enacted by 1919 Legislature Provides for the Improvement of a 6,000-Mile System of Primary Highways

Iowa, in her new road law, has presented to her an easy, workable, financial plan for improving and hard-surfacing her primary road system of 6,278 mi. in approximately ten or a dozen years, on a pay-as-you-go basis, without the issuance of state or county bonds.

Her counties are, however, if they get impatient, presented the alternative of anticipating their regular allotment of funds. After authorization by a popular vote, they may issue bonds of not to exceed 15 years' duration at 5% interest, and may proceed as fast as they desire, or labor and materials to do the building can be secured.

The money to do the work, probably $150,000,000 all told, is to be derived from three sources:

First: Annual federal aid allotment.

Second: Annual apportionment of motor vehicle license fees.

Third: Special assessments against benefited property.

All Iowa highways, under the new law, are divided into two systems—the Primary and the Secondary. The Primary road system was authorized by the 37th General Assembly two years ago to be selected as the inter-county system. It comprises a network of approximately 6,300 mi. of the most important highways in the state. The system connects every city, town or market place of 1,000 inhabitants or over. An estimate indicates that probably 85 to 90% of the population of the state lives either in these towns or on this system of roads. Its mileage was selected by the county engineer and the supervisors of each county and recommended to the Highway Commission. The Commission, after a study of the entire state system as a whole, and after innumerable conferences with engineers and boards and delegations of citizens, formally recommended these roads as the primary system. The Legislature, in the new law, finally established the system.

The law also establishes what is called the primary road fund. This fund is to be spent only upon the primary road system. The fund is made up of the motor vehicle fees and the federal aid allotments coming to Iowa from the Government. It is reasonable to expect that these sources will swell this fund annually to at least more than $8,000,000. To this, as the money is spent, must be added the 25% of the cost of each hard-surfacing project which is assessed against benefited property.

The primary road fund belongs entirely to the 99 counties. It is to be apportioned to them according to area. Each year, as the funds accumulate, each county is credited on the Highway Commission's and the State Treasurer's books, with its proportion of the money then available. The county, however, will not receive its share annually, or at the time it is apportioned. Instead, based on computations as to the amount of federal money coming to Iowa to be distributed and an estimate of probable motor vehicle fees for the period covered by the federal aid allotment, the total due the county from both sources for the period will be estimated. The counties will be handed their full allotment of funds for the entire period at one time, taking turns as to which shall receive the funds each year. Thus instead of building piece-meal with an annual allotment, each county will have its entire apportionment for the period to use at one time and upon one comprehensive project.

The primary fund sources are expected to produce even in 1920, not less than $10,000,000 cash in hand for road building and maintenance. With the anticipated increase in the use of automobiles and in motor trucks and tractors, together with expected increases in the amount of federal money distributed to individual states in recognition of the federal obligation to help in the building of through roads, it is believed there will be secured each year enough money to build any mileage of roads for which labor and materials can be secured.

This plan utilizes the existing Highway Commission and the county road building organization of supervisors, engineer and assistants. The system of handling county and township road work and federal aid road building, of letting contracts after competitive bidding, of working under state supervision and according to state standards, and in accounting in detail for the cost of all construction, repair and maintenance work, which have been developed in five years' actual practice, are almost unchanged. All methods of procedure in road building and accounting, thus, with some slight necessary changes, are identical with what state road builders are at present familiar and accustomed to through every-day usage. Those versed in the management of highway projects will understand what it means to have the organization and system with which all are familiar continue unchanged as the basis under the new law.

Supervisors of their own volition under the law may accept federal and state aid, and proceed, according to the method laid down, to grade, drain, gravel or oil any part of the primary road system. They cannot, however, hard-surface any part of the primary system of roads without first submitting, either on their own volition or on petition of 10% of the voters of the county, the question at a special or general election, as to whether or not the county as a whole shall adopt the general policy of hard-surfacing its highways. Not a foot of pavement can be laid on even the inter-county or primary system or a dollar of the federal or state aid money be used for paving unless the people of the county vote in favor of doing so. Once hard-surfacing is adopted as a county policy the supervisors can go ahead with individual projects as they may determine without additional vote of the people. Upon failure to authorize hard-surfacing the proposition cannot be submitted again to the voters for 24 months.

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*From the "Iowa State Highway Commission Service Bulletin."

There is another option by which the county can proceed, after a county has voted favorably in the surfacing policy, with the hard-surfacing proposition. This is by what is popularly known as the "Florida plan." The supervisors may make plans, following the usual procedure for such work, and enter into tentative contracts for the hard-surfacing of one or more sections of the primary system. At a special or a general election, the proposition of validating these contracts, and if necessary, of issuing bonds to meet the expense, is put up to a vote of the people. An affirmative vote validates all the contracts and the improvement may begin, and also any bond issue connected therewith may be authorized. A negative vote nullifies all tentative contracts and the entire proposition is killed.

Owners of land adjoining the primary system need not have fear that the building of a hard-surfaced road will confiscate their property. Four per cent. on the fair market value is the maximum limit of special assessment allowed against benefited property. On $200 an acre land, for instance, the maximum possible to levy could be but $8.00 per acre. The law provides that assessment shall be made against property not over 1½ mi. back on each side from the road, making a 3-mi. benefit zone. Special assessments against property, figuring on a $20,000 per mile road, and property paying 25% of the $20,000, would be but $5,000 per mile. To produce this $5,000 from the 3-mi. zone a graduated scale of assessment might be made at $5 per acre for the first quarter mile back; $4.00 for the second, $3.00 for the third, $2.00 for the fourth, $1.00 for the fifth and 62½ ct. for the sixth. This would produce the amount needed to cover the 25% of the total cost required from benefited property. Five dollars per acre, $200 per 40 acres, or $800 per quarter for a quarter section farm abutting the road for the entire mile, and the privilege of paying the entire $800 in cash or in ten annual payments of $80 each, would hardly confiscate any landowner's farm.

Assessment against the property is made by a board of appraisers consisting of three men. They may make the assessment against the property upon any equitable system they may select. The board of supervisors may reject the entire assessment if it deems advisable and order an entirely new assessment made. Landowners objecting to the assessment, have the right of appeal first to the supervisors, then to the district court which has final authority.

Provision is also made, after a county at a general election has voted favorably upon the hard-surfacing policy, for paving portions of the secondary roads, either county or township system. Supervisors may establish paving districts, without general or special elections, upon petition of 20% of the landowners in the proposed district. Public hearings are called where all interested can appear and be heard. The board has authority to decide whether or not to permanently establish such district and go ahead with the desired improvement. If the district be on a county road, the county road cash fund pays 75% of the cost and the property benefited 25%. If the district be on a township road, the county road cash fund pays 25%, the township road fund 50% and the property benefited 25%.

The township is permitted, it may be added here, by the new law, to levy in addition to all present levies an additional 2 mills upon all property, either for this or the regular township road building. The county road fund, likewise, is given a decided boost in a section of the new law which extends the county road building fund levy of 2 mills over all the property of the county instead of limiting it as formerly to rural property only. The effect of the law is to extend the levy, now only on rural property, over city property also.

These two features of the law will add considerable road building money for both the county and the township and make possible much more high class construction on the two parts of the secondary system. The county also is helped in caring for its county road system by reason of the fact that the primary road system takes on an average in each county 60 mi. out of the county road system. This is, in many cases, nearly a third of the entire system. The result is that the former county road funds which are hardly touched by way of reduction under the new law, will, with the added money now received from extending the 2-mill tax over the city property and the reduced mileage of the system, give more money per mile on the average on the remaining balance of the county system than these roads have ever had before for either construction or maintenance.

In another brief supplementary law, township trustees are authorized to add an additional levy of 1 mill on all property, to be used solely for road dragging and maintenance work. All told, under the new law the secondary roads, both the county and the township systems, seem to be assured of more construction and better maintenance than ever before, despite the fact that the state will be spending ten or more million dollars per year upon the 6,300 mi. of the primary system.

Provision for preventing roads passing through towns from being the worst stretches on the public highways, as they frequently are now, are made in the new law. Supervisors are given authority to hard-surface such stretches of road, paying for the same; but the town is obliged to pay all costs of grading and draining the road surfaced and maintaining the surface laid by the supervisors. The board may also hard-surface roads adjoining or lying along corporate limits of cities, and the city shall pay one-half the cost.

All primary roads, it is stipulated, shall be maintained by the supervisors to the satisfaction of the Highway Commission. Still further, the Highway Commission is authorized to assume maintenance of any neglected section of the primary system and charge the cost of maintenance of the same to the county's allotment of the primary fund. Maintenance of primary roads through towns may also be assumed and the expense charged up to the town.

Provision is made for the buying of material and equipment for individual counties by the Highway Commission. The commission is also authorized to accept road building equipment offered for distribution by the Federal Government and make such distribution of it to the counties as may seem desirable.

◆

The City of San Antonio, Texas, will vote on July 26 on the issuing of $3,950,000 in bonds, of which $900,000 is for paving and storm sewers.

Surveys for the New York-New Jersey Vehicular Tunnel have been commenced under the direction of Clifford M. Holland, Chief Engineer of the New York and New Jersey Interstate Bridge and Tunnel Commission.

The County Commissioners of Minnehaha County, South Dakota, have divided the county into six road districts for the administration of road maintenance work. By the plan which the commissioners will put into effect, this work will be under the supervision of the county highway engineer who will give his entire time to it. Each road district will be provided with an automobile truck and a drag. With the state highways, the roads included in the six districts have a total length of 320 mi.

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIII **July 16, 1919** **No. 3**

LABOR-SAVING MACHINERY TO MEET INCREASED ROAD BUILDING COSTS

The problems facing engineers engaged in public work in Great Britain are discussed at some length in a paper by the city engineer of Cardiff, Wales, which is printed on other pages of this issue. Because of their similarity to the difficulties which American road builders are facing, some of Mr. Elford's suggestions for meeting them should be of more than passing interest to engineers in this country.

The labor question, as Mr. Elford points out in closing, is one of the most troublesome in Great Britain. It is also probably the most difficult one that will have to be met here, where, as on the other side, the cost of public work has very greatly increased. As one method of overcoming it, the author suggests a greater utilization of labor saving machinery and points out several branches of municipal work in which motor-driven equipment can be used profitably. While such equipment has been employed very extensively in this country, a still wider use is entirely feasible, especially if better loading methods can be devised. This is one of the points made by Mr. Elford, and merits study by road builders in this country. It should be possible not only to make greater use of the equipment already on the market, but also to devise new machines and to improve upon the existing ones.

Street cleaning is a branch of municipal work that offers an almost unlimited field for motor-driven equipment. Hand-sweeping will probably always be required in certain places and under certain conditions, but much of the work now done by hand could be done quite as efficiently and much more economically by machinery.

In country road work there is also a wide field for the use of labor-saving machinery, especially in excavating. The use of explosives is another possibility in this particular kind of work.

Mr. Elford made another very pertinent suggestion. He said: "Under present conditions it is not sufficient that members of the Institute should be content to rely upon manufacturers to introduce improved apparatus, but they should endeavor to think things out for themselves, and devise new and improved methods."

American municipal engineers are by no means less resourceful than others. Many of the labor-saving machines now in use are the results of their inventiveness, but it is quite possible that they would do well to take to themselves Mr. Elford's suggestion. The engineer who is doing work of a certain kind knows better than anyone else what kind of machinery is needed for it. He can employ his time to no better advantage than by developing equipment to facilitate his work.

HAULING WITH TRAILERS

Increasing utilization of trailers with trucks and tractors seems likely to be one of the features of the development of highway transportation. Their use is by no means new, even in this country, though they have been employed more extensively abroad than they have here. With the removal of prejudices against them their advantages in certain kinds of work will become more generally appreciated.

Elsewhere in this issue is a resumé of a recent statement from the Trailer Manufacturers Association in which attention is called to the change in the attitude of truck makers towards the trailer. Five or six years ago, it is said, they were opposed to the use of trailers, while they now advocate their employment when, in the judgment of their traffic experts, conditions warrant it. This view might have been expected, for the relation between truck and trailer is more cooperative than competitive, and truck manufacturers, as a class, are broad-minded and far-seeing business men.

Opposition to the trailer on the part of lawmakers and road officials is a much more serious matter. For some reason, the trailer seems to be regarded by some as particularly destructive to roads. Though the facts are quite the contrary, the prejudice is deep rooted and persistent. It will be overcome in time, of course, for the trailer is far too useful to be shelved because of a mistaken idea of its effect upon the highways.

Several very severe laws restricting the use of these vehicles have been proposed within the past year, but happily, most of them have failed of enactment. Legislation for the protection of the country's improved highways is desirable, but it should be very carefully considered. After all, roads are built to carry traffic and for no other purpose. Road building is only a part—though a most vital part—of the great task of providing transportation which, in turn, is an essential factor in the industry by which the nation's material prosperity is determined. Industrial progress is inevitable, but to a great extent it depends upon the development of transportation facilities; and no part of that development must be held back. If a tool is found good it can not be discarded because its use complicates some part of the process. When efficient railroading demands heavier rolling stock, roadbeds are strengthened; when the development of ocean and river transportation brings larger carriers, waterways are deepened and docks made larger. If the demands upon highway transport result in the utilization of new vehicles, the roads must be adapted to their use.

The trailer appears to meet the requirements of certain transportation conditions. Therefore, it should be used and will be used. Some regulation of that use is doubtless both necessary and desirable—as in the case of all carriers. But if highway transportation is to fulfill its promise, regulations must be drawn not to save the roads merely, but to promote their most effective use.

Massachusetts Road Laws

Appropriation and Motor Vehicle Laws Enacted by Legislature and Approved by the Governor

In addition to the enactments of the Massachusetts Legislature noted in previous issues, three laws, one an appropriation measure and the other two relating to motor vehicles, have recently been enacted by the Legislature of Massachusetts and approved by the Governor.

The appropriation bill provides $1,000,000 for state highway construction. This amount is an addition to the $3,091,324.64 previously appropriated for the use of the State Highway Commission.

The second law relates to the theft of motor vehicles and provides a penalty of imprisonment for not less than five nor more than ten years for the theft of an automobile or motorcycle, for receiving a stolen automobile or motorcycle, for concealing an automobile or motorcycle thief, or for concealing a stolen automobile or motorcycle.

The third act forbids the operation on the public highways of commercial motor vehicles, including motor-drawn vehicles, having outside widths of more than 96 in. or extreme over-all lengths of more than 28 ft., except when special permits are secured from the superintendent of streets, the selectmen, the Massachusetts Highway Commission or the local road authorities. The measure also provides that where more than one vehicle or trailer is operated, the length of the vehicles may exceed 28 ft., but must not exceed 65 ft. All of the dimensions include the loads. Penalty for violation of the act is fixed at $100 for each offense.

Road Improvement Near Kansas City

Good Roads Association of Greater Kansas City Working for Extensive Road Building Program

(Special Correspondence)

The road building program outlined by the Good Roads Association of Greater Kansas City provides for the construction of a system of hard-surfaced roads radiating 100 mi. from Greater Kansas City. The published maps include 20 trunk line highways, 2,000 mi., and about 3,000 mi. of connecting county roads. The work of this association is to assist the counties and communities in financing and promoting permanent improvement on all of these highways in the shortest possible time.

The population within this circle is now 1,500,000 people. In five years it will be 2,000,000. Within the circle there are over 100,000 trucks and automobiles, valued at over $100,000,000. Within five years this number will be doubled. The urgent need for dependable highways over which to operate these motor vehicles is appreciated by every person within the circle. The value of the farm crops and livestock sold for slaughter within the circle will approximate $500,000,000 this year. Most of this will eventually find its way to the Kansas City markets. With paved roads a great percentage of these products of the farm would be delivered to the markets of Kansas City by truck. Particularly would this be true of all perishable products and livestock. It means also that the people within this territory get a large portion of their manufactured supplies from Kansas City. Much of this could be delivered economically and expeditiously by truck if the roads were dependable.

A movement is on foot now to make one big demonstration in the near future by having one or more trucks leave Kansas City on each of these 20 trunk line highways, carrying local merchandise and perishable products for the people living in the towns along these routes. If sufficient merchandise can be promised there will be additional trucks to make the trips on each of these highways. The plans suggested by the manager of the Good Roads Association contemplate sending these trucks out in 20 directions simultaneously on the same morning, covering the 20 marked highways radiating from Kansas City. With each truck will be a four-minute road talker, who will explain to the people in each town, where the truck stops to unload, the purposes of the demonstration. The trucks will deliver their loads on the first day, remaining all night at the end of the route and returning the second day, taking on a load of poultry, eggs, vegetables and produce and delivering it to the market of Kansas City that night or the next morning. If the weather is fair and the roads are dry these trucks can make the trips regularly on schedule time. The improvement of these highways will immediately bring about an increased motor traffic to and from Kansas City over this entire territory.

Another important item to be considered in connection with the improvement of these roads is that every dollar expended on them will remain within the circle. When the roads have been constructed the people will still have the money and the roads in addition, which will be worth many times their cost in service rendered. A large percentage of the cost of the roads is common labor and this money will simply go into circulation and soon return to the original taxpayer.

The sentiment is strong for the construction of these hard-surfaced roads. A very important element in their speedy construction is the assistance which the Good Roads Association of Greater Kansas City is prepared to render to the people within the circle, by aiding in bond elections, benefit district petitions and all other necessary proceedings preliminary to the financing and building of the roads. With well directed efforts in this line the required time for the completion of this system of roads can be discounted fully 50%.

Road Funds for New Jersey Counties

State Highway Commission Allots State Aid and Motor Vehicle Funds

The allotment of state aid and motor vehicle funds to the various counties of New Jersey has recently been announced by the State Highway Commission. There will be available a total of about $3,500,000, of which about $460,000 will come from general funds and will be used for new construction, while the balance will come from the motor vehicle fund and will be used for maintenance and construction. About $500,000 of the latter fund has been set aside for the maintenance and construction of 300 mi. of state highway which will be placed under state control by Sept. 1, thus relieving the local authorities of considerable maintenance expense. The allotments of funds to the counties are as follows:

Atlantic, state aid, none, motor vehicle fund, $130,000; Bergen, state aid, $50,000, motor vehicle, $210,000; Burlington, state aid, $22,000, motor vehicle, $115,000; Cape May, state aid, none, motor vehicle, $119,000; Cumberland, state aid, $12,000, motor vehicle, $35,000; Essex, state aid, none, motor vehicle, $225,000; Gloucester, state aid, $15,000 motor vehicle, $50,000; Hudson, state aid, $50,000, motor vehicle, $160,000 (including $50,000 for the Hudson County Boulevard); Hunterdon, state aid, $8,500, motor vehicle, $40,000; Mercer, state aid, $15,000, motor vehicle, $110,000; Middlesex, state aid, none, motor vehicle, $110,000; Monmouth, state aid, $48,000, motor vehicle, $155,000; Morris, state aid, $37,500, motor vehicle, $100,000; Ocean, state aid, $35,000, motor vehicle, $50,000; Passaic, state aid, $17,000; motor vehicle $145,000; Salem, state aid, $25,000, motor vehicle, $70,000; Somerset, state aid, $15,000, motor vehicle, $85,000; Sussex, state aid, $25,000, motor vehicle, $40,000; Union, state aid, $15,000, motor vehicle, $70,000; Warren, state aid, $45,000, motor vehicle, $40,000.

To Award Pennsylvania Contracts

Bids for the Construction of About 97 Miles of Road To Be Opened by State Highway Department July 29

Bids for the construction of about 97 mi. of road on the primary highway system of Pennsylvania are to be received by the State Highway Commission on July 29. These bids are in addition to those received on July 8 for about 107 mi. of construction. The projects included in the letting are as follows:

Adams County, Route 41, Butler Township, 23,246 ft., reinforced concrete and hillside vitrified brick; Adams County, Route 123, Tyrone and Strabane Townships, 13,733 ft., 1-course reinforced concrete; Beaver County, Applications 122 and 124, Eastvale Borough and N. Sewickley Township, 14,481 ft., reinforced concrete; Bradford County, Route 287, Athens, Sayre and S. Waverly Boroughs, 15,207 ft., vitrified brick on concrete and bituminous surface course on concrete; Bucks and Montgomery Counties, Route 178, New Brition and Montgomery Townships, 15,898 ft., bituminous surface course on concrete or 1-course reinforced concrete; Chester County, Applications 557 and 558, Franklin and New London Townships, 21,219 ft., bituminous macadam surface course on Telford; Chester County, Applications 136 and 439, East and West Marlboro Townships, 10,509 ft, bituminous macadam surface course on Telford; Chester and Delaware Counties, Route 142, Tredyffrin, Easttown, and Radnor Township, 46,815 ft., bituminous mixture on prepared broken stone base; Crawford County, Route 82, Vernon Township, 18,619 ft., 1-course reinforced concrete and hillside vitrified brick or 2-course reinforced concrete and hillside vitrified brick; Crawford County, Route 89, East Mead Township, 18,640 ft., 1-course reinforced concrete and hillside vitrified brick; Erie County, Route 86, Girard Township, and E. Springfield Borough, 20,400 ft., bituminous surface course on concrete and hillside vitrified brick or 1-course reinforced concrete and hillside vitrified brick; Erie County, Route 304, Northeast Township, 7,900 ft. bituminous surface course on concrete or 1-course reinforced concrete; Erie County, Route 86, Mill Creek Township, 21,120 ft., bituminous surface course on concrete or 1-course reinforced concrete; Fayette County, Route 112, Menallen Township, 19,918 ft., vitrified brick on concrete; Jefferson County, Route 60, Pine Creek Township, 25,972 ft., 1-course reinforced concrete and hillside brick; Lawrence County, Route 81, Union and Mahoning Townships, 29,628 ft., 1-course reinforced concrete and hillside vitrified brick or 2-course reinforced concrete and hillside brick; Mifflin County, Route 29, Armagh Township, 24,049 ft., bituminous surface course on concrete and hillside vitrified brick or 1-course reinforced concrete and hillside vitrified brick; Montgomery County, Route 153, Springfield, Whitemarsh, Upper Dublin and Lower Gwynedd Townships, 37,723 ft., bituminous surface course on concrete and hillside vitrified brick or 1-course reinforced concrete and hillside vitrified brick; Montgomery County, Route 178, E. Norritton Township, 5,575 ft., bituminous surface course on concrete or 1-course reinforced concrete; Northampton County, Route 297, Bethlehem and Lower Nazareth Townships, 25,655 ft., bituminous mixture on prepared broken stone base; Susquehanna County, Route 9, Hopbottom Borough, Lathrop, Lenox, Harford and New Milford Townships, 53,806 ft., bituminous surface course on concrete or 1-course reinforced concrete; Union County, Route 27, Lewis Township, 11,484 ft., 1-course reinforced concrete; Washington County, Route 268, E. Bethlehem Township, 9,480 ft., 1-course reinforced concrete and hillside vitrified brick; Washington County, Route 108, Canonsburg Borough, 1,106 ft., vitrified brick; Westmoreland County, Application 527, N. Huntingdon Township, 7,408 ft., 1-course reinforced concrete; Westmoreland County, Route 117, Hempfield Township, 12,065 ft., 1-course reinforced concrete and hillside vitrified brick.

In addition, bids will be received for the construction of two bridges. One is to be a 3-span structure on the Lackawanna Trail in Nicholson Township, Wyoming County. The other is on Route 127 in York Township, York County.

Maintaining Detours in Pennsylvania

State Highway Commissioner Sadler Asks Counties to Accept Responsibility During Construction of New Roads

Before the opening of bids for about 107 mi. of road work in Pennsylvania on July 8, State Highway Commissioner Sadler wired to commissioners of counties affected, asking them to advise whether or not they would accept the responsibility of maintaining the detours that would be necessitated by the work. The counties affected are Bradford, Bucks, Butler, Centre, Clearfield, Clinton, Delaware, Fayette, Lehigh, Luzerne, Somerset, Sullivan, Susquehanna, Tioga, Westmoreland, Lackawanna and York.

The following letter confirming his telegram was sent to the county authorities:

"In the construction of the modern permanent types of highways in our state, it is absolutely necessary that from time to time travel shall be diverted from the project under improvement, so that, under the direction of our engineers, detours over other roads must be maintained for the convenience of the traveling public. Under the laws, the State Highway Department cannot expend its funds for repairs and maintenance, except on state highway routes and state aid roads. It is, therefore, absolutely essential to look to the local authorities to perform this service. In many cases the townships are not able financially to carry the burden; and it becomes necessary to depend upon the county commissioners to assume the duty or make the necessary contribution from the county's funds. This you have ample power to do under existing statutes. The inconvenience to the traveling public has been so great in certain sections of the state that it has become necessary for us to ask the county commissioners whether they will assume the responsibility, before the contract is awarded. As indicated in my telegram, bids on projects in your county will be opened tomorrow. Before any award is made, we desire to have your reply to our inquiry."

◆

Extensive Street Improvements in Chicago, Ill., are included in the plan proposed by the lake shore development ordinance, which has recently been recommended for passage by the council committee on railway terminals. The project involves an expenditure of $110,000,000 and after eight years of negotiation, participated in by the city, the South Park Commission, and the Illinois Central Railroad, a definite plan has been agreed upon. This includes the electrification of the railroad, the erection of a stadium in Grant Park, extensive filling along 5 mi. of the lake front, and the building of an outer drive beginning near the mouth of the Chicago River and connecting Grant Park with the Lake Shore Drive. The plans also call for the construction of five new viaducts over the railroad near Grant Park and six between 12th and 47th streets.

HIGHWAY TRANSPORTATION

Motor Truck Manufacturers Indorse Use of Trailers

Many Workers of Motor Trucks Recommend Trailer Equipment After Investigation of Its Economy and Efficiency

Although five or six years ago some of the leading manufacturers of motor trucks were opposed to the use of trailers, their present attitude is quite different and they are not only building special machines to haul trailers, but are recommending the use of trailers and semi-trailers under certain conditions, according to a recent statement from the Trailer Manufacturers Association. As an instance of this attitude, there is cited a letter from the district manager of a light truck company to one of the large trailer manufacturers. A portion of this follows:

"I am frequently called upon to furnish information concerning the adaptability and profitable employment of trailers to meet various conditions of truck transportation. My work is first and last that of placing our own trucks in service, yet I realize that the trailer proposition is so closely related to truck transportation that in making a true delivery analysis, to ignore the trailer is to work an injustice to efficiency and economy. The trailer has received scant consideration by dealers as against its importance. When I can conscientiously recommend their use, I shall be very glad to do so, in the interest of all concerned."

In further proof of the assertion, the statement of the Trailer Manufacturers Association calls attention to other communications from truck manufacturers, including some of the leading makers. A letter from the General Motors Truck Co. is quoted as follows:

"A very large number of GMC trucks are now hauling trailers successfully. In fact, the last year has seemingly been a period in which the transportation people of the nation have, with almost one accord, come to realize the fact that through the use of suitable trailers the earnings of the motor truck are doubled, and in some cases more than doubled. Through tendency on the part of the buying public, coupled with our own belief that by the use of the trailer still greater economies are possible, our Model 41-T GMC tractor was designed and is now in regular production, being of 6-ton capacity and used in connection with the semi-type trailer as well as four-wheeled trailers."

Another letter, from the Gramm-Bernstein Motor Truck Co., calls attention to the fact that it furnishes a spring trailer draw-bar as regular equipment, and says: "This would indicate our position on the trailer question and, in fact, we are very strongly in favor of such devices, in a good many cases, to increase the efficiency of our truck. We manufacture tractor trucks in 4, 5, 7 and 10-ton capacities for use with semi-trailers."

The Service Motor Truck Co., according to the statement, manufactures special tractors for use with the semi-trailer and rocking fifth wheel, and its dealers recommend the use of trailers when they are sure the interests of the owner will be advanced thereby. The transportation engineering department of the J. C. Wilson Co. has been investigating the subject and strongly recommends the use of trailers and semi-trailers. The Sterling Motor Truck Co. manufactures tractor trucks and equips all of its dump trucks with trailer attachments and furnishes similar equipment on other commercial tractors, when ordered. The Winther Motor Truck Co. manufactures a tractor of from 2 to 7 tons capacity and its dealers are instructed to recommend the use of trailers and semi-trailers with its regular models, if customers cannot be interested in the special tractor.

Military Truck Train Starts

Motor Transport Train of 60 Trucks Starts from Washington on Trip to Pacific Over Lincoln Highway

The start of the army truck train on its transcontinental trip, which was announced in "Good Roads" for July 2, was made on Monday, July 7, from Washington, D. C.

As previously noted, the train will follow the Lincoln Highway as closely as possible and is expected to reach San Francisco in about 60 days. It comprises some sixty units including 35 army trucks and a large number of special units and is manned by 209 men of the Motor Transport Corps and nine officers. It is commanded by Col. C. D. McClure, who recently returned from duty as an infantry of-

Warner Trailer and GMC Truck.

Trailmobile and Service Truck.

TRAILERS HAULED BY MOTOR TRUCKS FORM EFFICIENT HAULAGE UNITS.

ficer in France. Before the start was made, Col. McClure received from Lieut. Col. Henry B. Joy, one of the founders of the Lincoln Highway Association, the following message:

"The sending of the convoy of motor trucks by the Motor Transport Corps to the Pacific Coast via the Lincoln Highway is the realization of the vision of the highway's founders. The commercial and military needs of such a main artery highway were paramount in the minds of its originators.

"Commerce has been using the Lincoln Way for several years throughout its length. The Army used the eastern third of it extensively during the war, transporting overland under their own power thousands of trucks from middle western factories to seaboard loading points and carrying thousands of tons of munitions.

"I am very proud of the connection I and my company had with the inception of the Lincoln Highway idea. For several years prior to 1913, the year the Lincoln route was established, I sent all experimental motor car testing trips for the Packard Company westward in search of the best route to the Pacific. I drove various routes myself and studied the general topography. The final location of the highway became a matter of the simplest decision logically forcing itself by the accumulated data as to its feasibility.

"Your truck train run should be an object lesson which will lead to the wise location of other main artery routes and the building of them as fast as the ways and means can be provided. The needs of agriculture and industry require it, and last, but not least, the military needs."

Automobiles in Pennsylvania

Figures Announced by State Highway Department Show Great Increase in Number of Motor Vehicles During the Past Five Years

A great increase in the use of automobiles and motor trucks in Pennsylvania is shown by figures recently announced by the State Highway Department. During the past five years the number of pneumatic tired vehicles registered has increased from 86,670 to 373,629 and the number of solid tired vehicles has increased from 5,410 to 34,294. In addition, tractors have increased from 417 in 1914 to 1,679 in 1919 and trailers from 135 in 1914 to 1,099 in 1919.

The receipts for the six months' period ending July 1, 1919, for all registrations amount to $4,392,236, divided as follows: Pneumatic tired vehicles, $3,547,325; solid tired $508,265; tractors, $7,885; trailers, $3,353; motorcycles, $62,841; drivers, $140,670; tractor drivers, $164; dealers, $85,150; tractor dealers, $1,166; transfers, duplicates, etc., $35,417.

Pleasure Automobile Mileages

Inquiries Among 250 Car Owners Show Average of 38 Miles on Evening Trips

In order to determine the average mileage covered by automobiles used for pleasure trips in the evening an investigation was recently made in a middle western city. The inquiries were addressed to about 250 car owners in a city of about 300,000 population and showed that the average was about 38 mi., according to W. L. Kissel, Secretary and Treasurer of the Kissel Motor Car Co.

Sixty-two per cent. of those questioned replied that they would make longer trips if the roads permitted and 85% said that their trips were usually made out into the country.

"From these figures," said Mr. Kissel in commenting upon the results of the investigation, "it is easy to see that more good roads will increase the growing popularity of the automobile which will, in turn, help to build up communities, relieving congestion in the crowded cities, create a wider circulation of money, increase realty values, lower transportation costs and introduce 'America First' to more people."

Unfair Competition in Haulage

"Wild Catting" by Occasional Operators Detrimental to Development of Reliable Companies

The Highways Transport Committee calls attention in a recent statement to a practice that is causing much annoyance to motor trucking companies operating on regular schedules. This is the hauling by a few individuals of freight for considerable distances at rates that it is impossible for a company operating on a regular schedule to meet. It is pointed out that this practice tends to discourage the establishment of regular routes operated at a cost just sufficient to make the venture financially successful.

It is suggested that there ought to be some way by which operators could be protected against these occasional invasions of their field, and the Highways Transport Committee suggests that the matter is one which could be well taken up by the state highway transport committees.

Truck Transportation Associations

The organization of truck transportation associations in several of the larger cities is cited by "Haul-Age," the dealer publication of the Garford Motor Truck Co., as an indication that motor truck transportation is taking its place alongside of railroad transportation.

These associations have been founded by cartage and storage concerns operating motor trucks, for the organized and systematic promotion of motor truck transportation. Among their chief objects is the establishment of inter-city and rural motor express lines. Through central offices it is planned to aid members of the associations in eliminating waste through idle trucks, less than capacity loads and lack of return loads. They will also make it possible for merchants desiring service to put in a single call instead of having to apply to different trucking companies.

Associations have been formed in Toledo and Detroit and efforts are now being made to bring about their affiliation.

Statistics on Traffic Accidents

Figures on Fatal Street Accidents in Cities of Washington and New York Given Out by Highways Transport Committee

During the six months ending on Dec. 21, 1918, deaths from traffic accidents were at the rate of 82 per year in Washington, D. C., while in New York City the number killed during 1918 was 679. On the basis of a population of 425,000 in Washington and 6,000,0000 in New York, the rate for Washington should have been 48 to be the same as New York, according to a recent announcement by the Highways Transport Committee of the Council of National Defense, which is conducting a safety campaign, as has been noted in previous issues.

The committee also finds that the deaths from traffic accidents in Washington have steadily increased during the past three years, while in New York the rate has remained fairly stationary. It is also pointed out that if the death rate in Washington were assumed to hold for the entire country, the number killed in the United States during 1918 would have been 21,221.

Garford "Haul-Age"

"Haul-Age has been selected as the name for the new dealer publication of the Garford Motor Truck Company, the initial appearance of which was noted in the issue of June 3. The name was selected from scores of suggestions submitted in a prize contest outlined in the first issue.

While the publication is devoted primarily to the interests of Garford dealers and distributors, its contents include many articles of general interest to the automotive industry. Julian M. Chase, Advertising Manager of the Garford Motor Truck Co, is the editor of the house organ, which is published monthly.

MEETINGS

Calendar of Coming Meetings

Aug. 6-8.—North Carolina Good Roads Association.—Annual convention, Wrightsville, Beach, Wilmington, N. C. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

Nov. 12-14—American Society of Municipal Improvements. —Annual convention, New Orleans, La. Secretary, Charles Carroll Brown, 304 East Walnut St., Bloomington, Ill.

Feb. 9-13, 1920—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

PERSONAL MENTION

George H. Willits has resigned as city engineer of Galveston, Tex., to become assistant county engineer of Dallas County, Texas.

D. L. Lewis, formerly assistant city engineer of Fort Worth, Tex., has been appointed city engineer succeeding E. J. Von Zuben, resigned.

C. C. Jones, formerly county engineer of Watunsee and Osage Counties, Kansas, has been appointed a division engineer of the Kansas State Highway Commission.

A. S. McFadden has resigned as assistant engineer of the Kansas State Highway Commission to become associated with the Kansas Engineering Co., of Topeka, Kan.

G. C. Stanley has been appointed highway engineer of Cherokee County, South Carolina, succeeding N C. Hughes, resigned. Mr. Stanley was formerly assistant county highway engineer.

Lieut. Robert J. H. Worcester was discharged from the army in May and has returned to his former position as engineer and superintendent of roads and bridges of the town of Concord, Mass. Lieut Worcester served with the 42d (Rainbow) Division in the Argonne and in the Army of Occupation.

A. B. Hungerford has been appointed city manager of Hudson, Kansas.

Winston E. Wheat has been appointed county engineer of Escambia County, Florida.

N. C. Hughes has resigned as highway engineer of Cherokee County, South Carolina.

R. C. Bailey has resigned as county road commissioner of Shiawassee County, Michigan.

Clyde Walters has been appointed field engineer of the Colorado State Highway Department.

C. T. Felps, formerly of the 23d Engineers, has been appointed a division engineer of the Kansas State Highway Commission.

William Steinberger has been appointed county road engineer of Doddridge County, West Virginia. Mr. Steinberger was formerly a division engineer of the West Virginia State Highway Department.

W. G. Kirkpatrick, City Engineer of Birmingham, Ala., has been appointed consulting engineer of the city of Monroe, La. Mr. Kirkpatrick's appointment is for four years and he will serve in an advisory capacity to all the city departments.

EQUIPMENT–TRADE–MATERIALS

Lime Association Donates Hydrated Lime for Maryland Road Tests

Through the Lime Association, 20 tons of hydrated lime have been donated to the Maryland State Roads Commission to conduct field tests on two concrete road contracts, one at Bellaire and the other at Muirkirk.

The experimental work is in charge of the Sub-Committee on Highway Lime of Committee C-7 of the American Society for Testing Materials and will be commenced at an early date. On both the contracts central mixing plants are being used and the mixture is hauled to the work by trucks, in some cases as far as 7 mi.

The Powell Paving and Contract Co. has been organized at Columbia, S. C., by H. W. Powell and J. D. Powell.

The Middle States Construction Co. has been organized at Peoria, Ill., by A. R. Montgomery, Jr., W. S. Gearhart, and W. B. Kester.

The Walter A. Zelnicker Supply Co., of St. Louis, Mo., has added 2,000 sq. ft. to its present office space at 325 Locust St. This is an increase of about one-third.

"It's a 'Dandie'" is the title of a large folder recently issued by the Koehring Machine Co., of Milwaukee, Wis., descriptive of the company's "Dandie" mixer. The folder is printed in two colors and is illustrated by views of various styles of the machine.

The firm of Staley & Morris, engineers, has been organized by J. J. Staley and T. H. Morris at 2009 Market St., Philadelphia, Pa. Besides conducting a general engineering business, the firm represents the F. D. Cummer & Son Co., Cleveland, Ohio; Littleford Bros., Cincinnati, and the Edward F. Terry Manufacturing Co., New York, N. Y.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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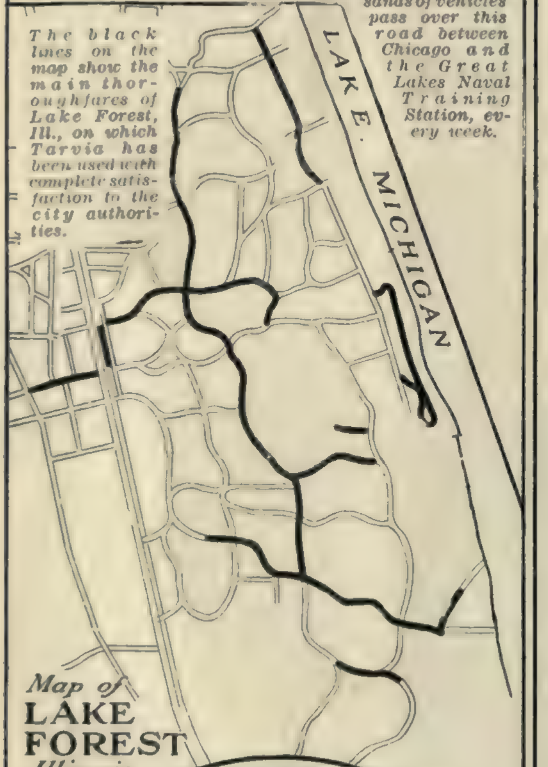
WARREN, OHIO

A driveway on the Lake Forest, Ill., estate of Mrs. C. H. McCormick. "Tarvia-X" two-course penetration and surfaced with "Tarvia-A."

A section of Sheridan Road, Lake Forest, Ill., 18,000 square yards of which have been Tarviated. Thousands of vehicles pass over this road between Chicago and the Great Lakes Naval Training Station, every week.



The black lines on the map show the main thoroughfares of Lake Forest, Ill., on which Tarvia has been used with complete satisfaction to the city authorities.

Entrance to the private estate of John T. Pirie, of Carson-Pirie-Scott Co., Chicago, Ill., at Lake Forest, Ill. Waterbound macadam treated with "Tarvia-A."

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The black lines on the map show the extent to which Lake Forest has adopted Tarvia for its main thoroughfares.

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WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVI.
New Series, Vol. XVIII.

NEW YORK, JULY 23, 1919

Number
4

Motor Transportation by the Army

Work of the Motor Transport Corps of the Army—Transcontinental Convoy—National Road System a Military Necessity

By J. M. RICHIE,

Lieutenant Colonel, Motor Transport Corps

At the time the United States entered the World War, the Army was in possession of very few motor vehicles. The mobilization of troops, supplies and equipment, as well as the distribution of materials of construction, created a condition as unforeseen as it was unprepared for. Each department, corps or bureau had been charged with the procurement of its own motor transportation, with the result that many types of chasses, and many designs of bodies had been purchased. This indiscriminate method of procurement, increasing many times the difficulty of maintaining equipment properly, was one of the prime factors making for the establishment of the Motor Transport Corps in August, 1918.

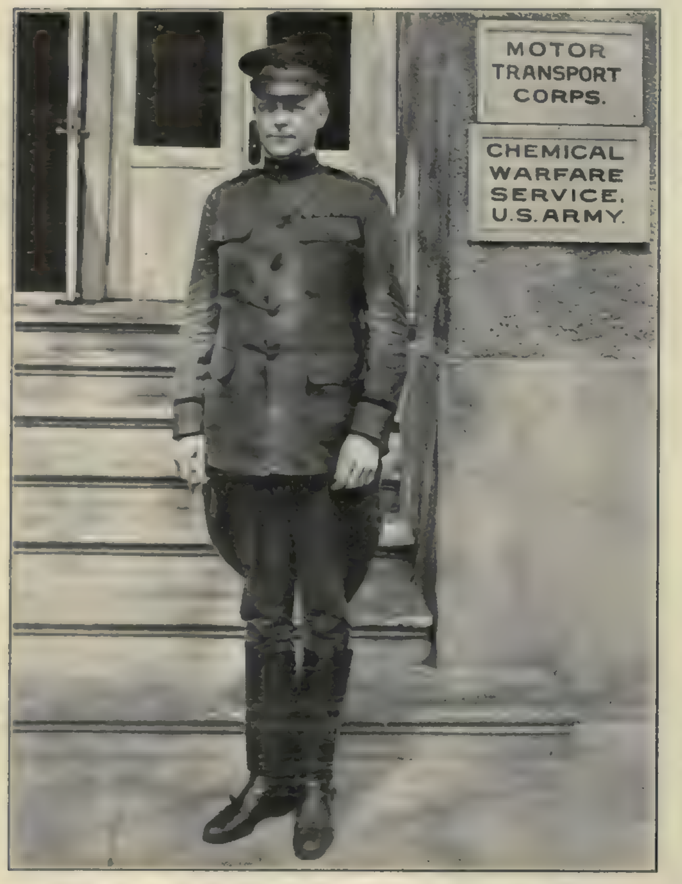
The functions of the Corps, as given in the general orders establishing it, are to design, produce, procure, operate, maintain and salvage all motor equipment belonging to the War Department, except caterpillar tractors and tanks, the control of which, because of their special functions, was vested in the Ordnance Department.

The result of this consolidation gave an opportunity to redistribute the equipment with a view to placing the fewest number of makes in each camp. The total number of vehicles in operation, in the United States, at the time the armistice was signed, was approximately 71,000 as given in the accompanying table.

The vehicles were used to transport equipment, supplies,

TRANSCONTINENTAL TRUCK TRAIN OF THE MOTOR TRANSPORT CORPS WHICH LEFT WASHINGTON, D. C., ON JULY 7, FOR SAN FRANCISCO, CAL.

and personnel within the camps and to nearby distribution centers. Regular hauling by convoy between New York, Philadelphia, Baltimore and Washington was established, also the delivery of motor vehicles from the manufacturing plants overland to the seaboard. The delivery of motor vehicles from the factory to the seaboard was made overland in convoy formation, the trucks proceeding under their own power and each vehicle carried a cargo of spare parts, crated passenger cars or light delivery trucks. In this manner, over 32,000 vehicles were delivered to the Atlantic Coast and over 9,000,000 lbs. of spare parts were carried as cargo.



BRIG. GEN. C. B. DRAKE, CHIEF OF THE MOTOR TRANSPORT CORPS.

Motor transportation presents two main phases—passenger carrying and cargo carrying. Passenger transportation may be divided into two classes: (a) Light, local traffic, and (b) heavy or cross-country traffic. Cargo transportation has need for three types of chasses—light delivery (¾-ton); medium delivery (1½-ton), and heavy duty (3-ton).

In providing for both passenger and cargo transportation, the question arises of types or makes of vehicles to be adopted for the various purposes. The United States Government needs, and will continue to need, both passenger and cargo transportation in sufficient quantities to warrant the adoption of a standard chassis for each of its types, and it has now on hand standard drawings and specifications covering each of these types, with a view to replacing the equipment now in operation with the standardized vehicles. This standardization will result in reducing the number of spare parts required to be carried in stock and in reducing the cost of the maintenance of vehicles to a minimum, with a resultant saving to the Government of millions of dollars. Further, the standardization of equipment will enable the Government to train specialists in the repair and maintenance of these types, with a resulting economy in labor and time.

This standardization permits not only the interchange of parts but also of bodies, which is not always possible now, as the writer knows of instances in which trucks had outlived their usefulness or needed extensive overhauling and because their particular make was not available the bodies could not be used, as they did not fit chasses available.

It is questionable whether it is advisable to standardize the chassis of the heavy type of passenger vehicle to a military standard, for the reason that the need of a heavy type vehicle is so small compared with that of the light vehicle that in an emergency a commercial vehicle can be utilized. For every 7,000 light passenger vehicles required, about 500 heavy passenger cars are needed.

In cargo transportation, dependability, not speed, is the requisite. With a mobile army, the cargo vehicles usually operate in convoys of 30 or more to a train, and the delivery of this number of vehicles cannot be made as a unit if the leading vehicle develops a high speed. An average rate of 10 mi. an hour is the most efficient speed of operation, as it enables the train to run as a compact unit and is easy on the chasses.

In connection with the development of motor transportation, the development and construction of modern highways becomes an important and essential factor. Statistics show that over a concrete road, for instance, gasoline consumption is less than half that on a dirt road.

All highways should be built in accordance with a comprehensive and carefully worked out system, based on the economic and military necessities of the country as a whole. The appropriation for the building of national highways should be under direct Government control and not at the disposal of the individual states, as is contemplated in the act recently passed by Congress which included the sum of $200,000,000 for highway construction. Placing the control of the expenditure of these moneys in the hands of the individual states may result in the building of a number of roads which when completed will not form a continuous link in the national highway system, or of roads designed to meet the popular demands of certain influential localities without regard to the national economic or military necessity.

ARMY MOTOR VEHICLES IN OPERATION IN THE UNITED STATES IN NOVEMBER, 1918.

Motor cars	9,407
Ambulances	4,291
Trucks:	
Lt. Del. & Rep.	4,811
Class AA, ¾-ton	3,352
Class A, 1½ to 2 tons	4,753
Class B, 3 to 5 tons	13,622
Class T, 4-wheel drive	7,932
Total trucks	34,470
Motorcycles	11,805
Bicycles	1,047
Trailers	9,927
Aggregate, all vehicles	70,947

The establishment of a national system of highways, designed, constructed, maintained, and controlled by the Government is of paramount importance for the rapid mobilization of troops, supplies and equipment in the event of an emergency.

In addition to the reasons set forth above, the economic factor is also important. The building of roads on a comprehensive plan, based not only on the military needs of the country but the economic needs as well, will enable the country to develop highways regardless of local politics or preferences, leaving to the states the problems of providing highways located to meet the local conditions in the territory through which they run.

Further, the building of national highways by the Government will enable the Government to standardize the design and the character of the roads and to maintain them at the highest point of efficiency without recourse to state assistance or supervision.

The development of rural post roads is also a reason why the Government should build a national highway system, as these post roads will have to be fed from main routes and the main routes should be under federal control.

Cooperation between cargo vehicle manufacturers and the highway engineering departments should be established, with a view to limiting the maximum capacity of cargo vehicles, for the purpose of preventing destructive and unwarranted loads upon the highways. From a commercial standpoint a 5-ton truck is probably the maximum that should be built. This truck when loaded to capacity has a total weight, including chassis and cargo, of 10 to 11 tons and the thrust developed under a speed of 10 mi. per hour is such that only the highest type of roadway construction can stand it.

An additional factor of limitation should be the maximum width of vehicle, including the body. City planning experts look upon the unit for vehicular traffic as 9 ft.; therefore, providing for adequate clearance, the maximum width of body should be 7 ft. 6 in.

Highways and the Duty of Their Builders

Modern Motor Truck Transportation Demands Durable All-Year Roads that Will Make Profits

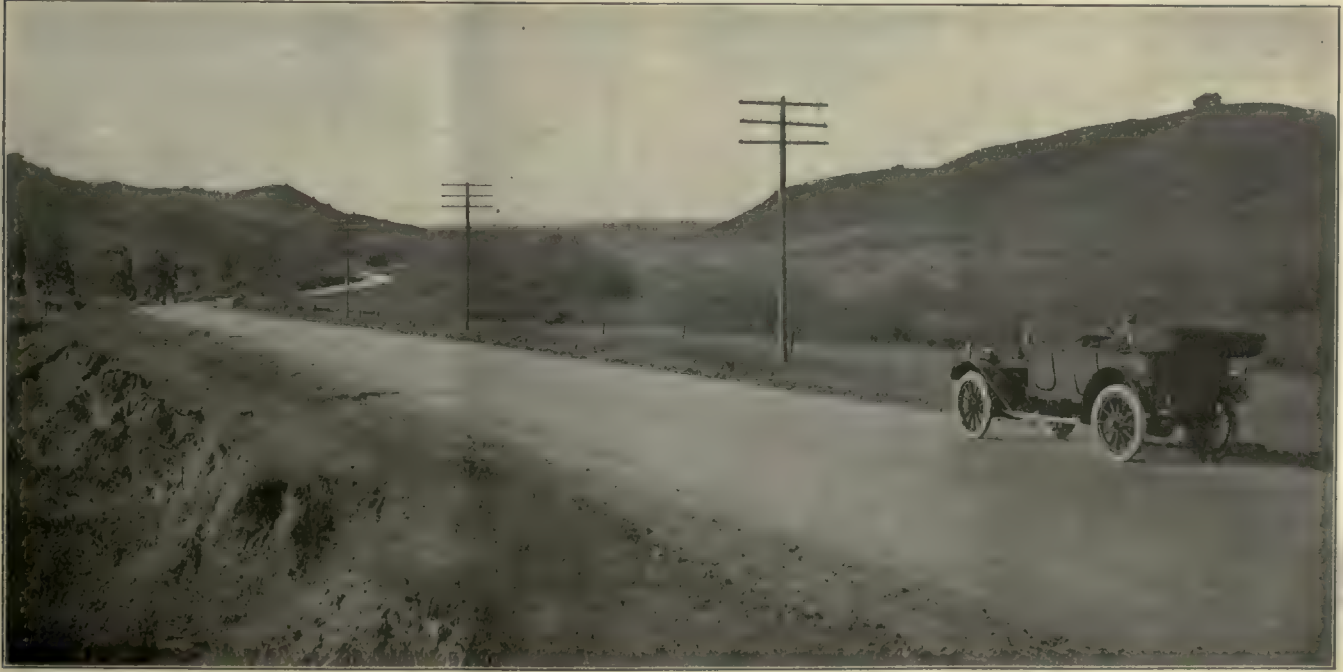
By S. M. WILLIAMS,
President of the Highway Industries Association
and Chairman of the Federal Highway Council

Highways and the men who build them are going to occupy a place of supreme importance for the next decade in the domestic affairs of the United States—highways, because of the increased service they must render in the ever enlarging field of transportation; and the men who build them, because we are now at a period in our national growth when business principles and sound construction must be applied, if the millions of dollars now going into our public highways are to be used wisely and to the profit of the people who are so generously providing the capital.

The output of our producing groups—agriculture on the one hand and manufactures and mines on the other—converges on the highway en route to its ultimate destination. Figures of speech fail to convey an adequate impression of the total amount of this tonage. This, however, may be said: From the day when we first began fencing off roads in this country—never dreaming that anything more than a soft earth top would be necessary—the tonnage from these groups has increased so that we are now producing enough freight every twelve months to load 71 solid railroad trains standing side by side and reaching from the Atlantic Ocean to the Pacific. Remember, this is freight hauling, not joyriding, and that this enormous tonnage, at one point or another, must go over the highway to or from the railway.

It may be said that this enormous tonnage is already going over the highways, but it is still being transported largely by wagon which, owing to its slower movement, is causing a waste of perishable produce amounting to millions of dollars every year. It is very clear, therefore, that increased production and the demand for greater economy and mobility in delivery is making the motor-driven highway freight car inevitable. This, in turn, is forcing the construction of more durable types of roadbed.

With tonnage and motor-driven vehicles both highly developed, we come to the point where we can determine with some degree of exactness two very important items—



TYPE OF ROAD THAT MAKES HIGHWAY TRANSPORTATION ECONOMICAL AND EFFICIENT—A ROAD LEADING TO THE MOUNTAINS FROM LOS ANGELES, CAL.

highway maintenance and vehicle operating costs. In these two points, plus the enormous amount of farm produce that goes to waste when roads are impassable, will be found the sum total of all losses entailed by roads that are now economically out of date. Here at this point, where the new wheel connects with the old road, is where our trouble begins. The impact results in damage both ways—on the loosely built roadbed beneath and on the expensive and highly developed vehicle above. By applying the principles of sound construction, the shock on road and vehicle is reduced to a minimum, increasing the life of both and making the avenue to market permanently independent of the weather.

Another point which we have overlooked is the fact that increased tonnage and the enlargement of the vehicle, with multiplied power back of it, has created a marked distinction between highways. Main lines or trunk routes have taken on a new meaning. Heavier types of construction must be used for them; while secondary roads on which traffic is not so dense are logically coming under another head where the construction may be of a lighter type.

So that out of the development of the past few years, there has been forged a new link in transportation. This new link fits in between the railway and the purely local or farm highway which feeds into it. It has reached a point in its use where sound engineering principles must be applied to its construction. And where such principles are applied the way will be thrown open for the development of inter-community transportation far beyond our present vision.

Those of us who are familiar with the successful conduct of any business, know that we cannot succeed by wasting our capital or our stock in trade. We must get a profit on our investment or the goods we sell in order that we may live comfortably and have a surplus to reinvest in further extending our various lines of business. Every well established mercantile house and every well equipped farm in any community, is a shining example of this economic truth.

Army Truck Stalled on an Unimproved Road.

Truck Train Plowing Through a Muddy Street.

Heavily Loaded Trucks on a Good Road in Ohio.

Inter-City Hauling on an Improved Oregon Road.

WHAT ROAD CONDITIONS MEAN TO HIGHWAY TRANSPORTATION—UPPER PICTURES SHOW RESULTS OF ROAD NEGLECT; LOWER PICTURES THE ADVANTAGES OF ROAD IMPROVEMENT.

We have now arrived at a point where we must make public highways pay. We have the tonnage and the rolling stock. All we lack is the proper roadbed, and with that built upon a modern basis, our dividends will come in the form of time saved and easier and more dependable transport to and from the market in the town or the homes of customers in the country. Not only that, but the investment which we make in this manner will become permanent, adding year by year to the accumulating wealth of our respective communities and increasing the comforts and pleasures of life.

One point above all we must keep in mind: that distribution must keep pace with production. It is now congested to the point of creating waste of food products in one community and want in another—not through a lack of mobility and strength of vehicles, but through an utter lack of dependable and durable highway surfaces. And the losses arising from the waste and want thus entailed are far greater than the cost of types of properly constructed highways.

The Highway Industries Association does not advocate any individual type of road, but it believes it is its duty—and the duty of every loyal citizen—to demand, regardless of the type or material used, that durability be built into the highways so that they may meet the traffic demands upon them with a safe margin of increase, and so that we shall no longer handicap transportation by attempting to fit it to the highways.

The Highway Transport Committee in War

History of the Committee's Formation, Its Organization and the Work Accomplished During the Great War

By ROY D. CHAPIN

President, Hudson Motor Car Co. and Former Chairman, Highways Transport Committee, Council of National Defense

There is a vastly different attitude throughout the country today toward our highways and highways transportation from that we found existing nearly two years ago, when the Highways Transport Committee was formed. Interest in their welfare is now widespread and a stable thing.

Of course, transportation at that time was beginning to be a very vital issue in our war program, and the Government had taken measures to assume control of the railroads and inland waterways to assure the movement of troops and war materials. Governmental interest in our highways and the transportation over them, however, began when Daniel Willard, then Chairman of the Advisory Commission of the Council of National Defense, appointed the Highways Transport Committee early in November, 1917. Its aim was to coordinate and make more efficient all forms of highway transportation and assist them to render the greatest possible assistance during the war.

It was essentially a "war committee" in that it was appointed to fill a war need, but its functions were not limited by this. The scope of its work contemplated a national quickening of the pulse of highways transport to leave it at the end of the war in a position to continue rendering all the assistance possible to the whole nation.

The first meeting of the Committee was held on Nov. 15, and R. C. Hargreaves was elected secretary. Comprised of practical business men, it was a very representative committee, covering the field of highways and highways transportation, as these names bear witness:

Roy D. Chapin, President, Hudson Motor Car Co., Detroit, Mich.; George H. Pride, President, Heavy Haulage Co., New York, N. Y.; Henry G. Shirley, State Highway Engineer of Maryland; and Logan Waller Page, Director, Bureau of Public Roads.

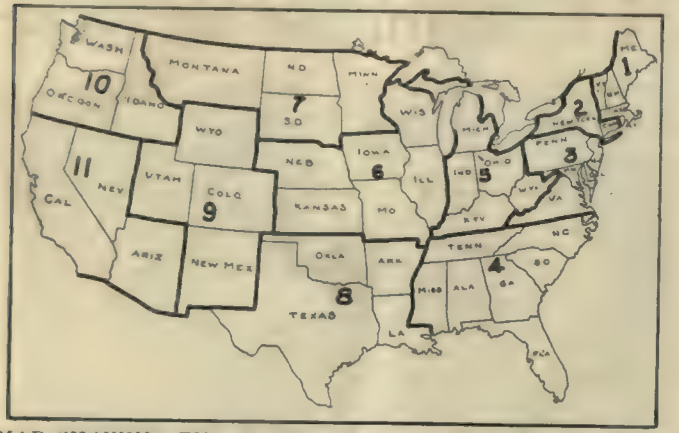
Shortly afterward Mr. Page was compelled to resign

MEMBERS OF THE HIGHWAYS TRANSPORT COMMITTEE, COUNCIL OF NATIONAL DEFENSE, WITH ITS REGIONAL CHAIRMEN AND SECRETARY OF THE INTERIOR LANE AT THE 1918 CONFERENCE.

because of pressure of official duties and his place on the Committee was not taken by another member.

Offices were secured in the Munsey Building and active work begun at once. One of the first steps was to secure the cooperation of the various Governmental departments directly or indirectly affected by highways transportation. A most helpful ally was secured by the cooperation of the State Councils Section of the Council of National Defense.

Almost immediately we found the War Department was confronted with the problem of moving some 30,000 motor trucks to seaboard from interior manufacturing centers and with the least possible delay. Winter was approaching rapidly, and with it the usual winter freight congestion on the railroads, plus the tremendous extra burden of war materials which were piling up at warehouses, freight terminals, and even being dumped beside the railroad tracks at the seaboard for lack of other accommodation. There was a correspondingly big gap between the demand and supply of freight cars. Just at this time, in conference with Brig. Gen. Chauncey B. Baker, who was handling this work, it was suggested that an overland trial run be made of some of these trucks to seaboard. It was believed possible to send a convoy of them under their own power over the highways, and thus immediately make practical use of our third potential transportation medium.



MAP SHOWING THE ELEVEN REGIONS INTO WHICH THE COUNTRY IS DIVIDED FOR ADMINISTRATIVE PURPOSES BY THE HIGHWAYS TRANSPORT COMMITTEE.

Plans were immediately made to try out this idea. To the Highways Transport Committee was delegated the task of laying out a suitable route. Such a route had to comprise the best roads available and at the same time be as short as possible. Our field engineer left Detroit with a pathfinding car used for this work, to lay out the first route of this kind in the United States. Never before had the United States Government made practical use of its highways in this manner.

Quite a bit of difficulty was found in laying a route which would connect up with good roads and not leave a gap somewhere along the route of a few miles of doubtful construction. Two such gaps were unavoidable, however, although later replaced with solid construction. One of these was between Detroit and Toledo and the other at the Ohio-Pennsylvania border, leading into the town of Beaver Falls, Pa.

But one route was laid out to begin with, securing the assistance and advice of each state highway engineer as his state was traversed and potential routes covered. This route ran from Detroit to Toledo, through Ohio via Cleveland, and into Pennsylvania at Beaver Falls, to Pittsburgh, and thence across the state to Gettysburg and down to Baltimore, Md.

The first convoy left Detroit one of the coldest days of the winter and with many men as drivers who had hardly handled a truck before. Exceptional progress was made until heavy snow was encountered near Monroe, Mich., which caused considerable delay. However, everything was ready to move on again next morning and average speed was maintained all the way. It might be termed good speed, in fact, in view of the newness of the route to the drivers and their inexperience in truck driving. So successful was this first trip considered by the Quartermaster Department that shortly thereafter daily convoys left Detroit for the East. Soon after a route was laid out from Buffalo to seaboard, while numerous feeder lines were laid out to connect with these two main routes.

Some idea of the benefit of this plan is gained when it is seen that but two trucks could be shipped in one freight car, thus requiring approximately 20 tons of shipping space per truck, or a total of 600,000 tons to ship these 30,000 trucks by rail. And not only did this plan relieve the railroads of the burden of carrying the trucks themselves, but through the convoys carrying capacity loads, an average of 2 tons per truck was secured in addition to the above, which meant something like 60,000 tons more available for war supplies. Surely a valuable addition to our transportation program! And this was not the least benefit derived, by any means. We must consider the extremely good training received by these men as they drove the trucks through, fitting them for such service overseas with a minimum of additional training to be given them upon reaching the other side where they handled the trucks under war conditions.

Coincident with efforts toward an increase of highways transport facilities, as well as an increase in the efficiency of their use, much study was given to the problem of terminal congestion of the railroads, and how relief might be furnished by highways transport.

With a view toward assisting the railroads in this direction, attention was given to directing short hauls over the highways, thus relieving the terminals of short distance freight. In Philadelphia, for instance, embargoes at one time were so strict that only freight for long distances and of certain classes was accepted for shipment. At this time highways transportation had to be relied upon for short hauls, with the result that it was found to be much quicker and more satisfactory. Upon the lifting of the embargoes much of this class of freight did not return to the railroads, which not only relieved them of an unprofitable class of freight, but allowed them to give better service and more attention to carload and long distance goods. Even for the distance between New York and Philadelphia, different companies organized for heavy shipping over the highways between these two points were very successful in moving war supplies and perishable goods.

England early found "light running," as they called operating a truck without a load, to be not only unprofitable and wasteful, but delaying important war operations, such as shell making, loading, etc. To eliminate this, what were known as "return load bureaus" were established in each town around a manufacturing center, and through close cooperation with each other, were able to match shipments to go out of the town with a truck which would be leaving empty after making a delivery there.

The cooperation of the Connecticut State Council of Defense resulted in the establishment of several of these bureaus in Connecticut with a master bureau at the state capitol. These bureaus were found to be of considerable assistance, and operated in connection with the local chamber of commerce or other important civic body, they were not expensive to maintain. The plan was so simplified that the driver of any truck, after delivering his load in the town, could step to the telephone and calling for "return loads," would be connected with that bureau. It then took but a moment to ascertain if there were a shipment available going in his direction, either to the point he started from or some point on the route. Many times advance notice of the fact that a truck would be returning empty from some town on a certain date would enable the return loads bureau in that town to secure a load for shipment by return of the truck at that time. Terms were agreed upon by the trucker and the shipper—the bureau assuming no responsibility beyond bringing the two together.

Perhaps the most interesting possibility of highways transport which we met with in our work was the rural express. Here highways transport was expressed in its truest form and in terms of the greatest possible service to the nation as a whole. For this is nothing more or less than the connecting up of rural communities and making available rural products to city markets through a regular over-the-highway delivery system—usually a motor truck, or several.

The first well developed rural motor express we came in contact with belonged to a keen, wide-awake farmer over in Maryland, about 20 miles from the national capital. Twenty years ago—before the age of motor power—what he is now doing would have been impossible. Rural communities that distance from a large city were practically isolated so far as quick communication with such a city was concerned. For then it meant a day's journey to reach the city and the amount of perishable produce brought in over the highways was practically negligible.

This particular man—Barnsley by name—started out with one truck, having in mind that he would carry his milk to the city for himself and eliminate driving 2 or 3 mi. each morning to send it on a very early milk train. The idea worked out so well that he was asked by his neighbors to take their milk with his. It soon became necessary to buy another truck, because of the amount he was requested to take. Nor did he then confine his operations to carrying the milk to the city. He was soon taking all kinds of farm produce—even livestock—to the city's markets. Each neighbor would leave beside the road or at his front gate —which thus became his shipping platform—anything he desired to ship to market that day, and when the rural express came along, each shipment—large or small—was swung aboard with the rest.

He not only acted as a common carrier, but was their agent at the market, and banker as well. On the return trip he brought back to them supplies and tools which they required.

Thus a whole community was able to dispose of its surplus small produce at a good profit, where for the lack of transportation it had formerly gone to waste. And one particularly impressive thing about this service was the great saving of labor effected. Barnsley performed the same service which a dozen others would have been obliged to do individually, taking their labor from production on the farm, and using their teams on non-productive hauling work on the road.

When our Committee took this idea up with the Food Administration to secure their cooperation, Mr. Hoover was particularly interested and desirous of seeing the movement stimulated. Through the cooperation of his department and state councils of defense, these rural express routes were inaugurated in all sections of the country.

Rural express met a great war need. It was the practical means of causing a greater consumption of local perishable foods and permitting the conservation of more concentrated and less perishable foods for longer shipment and increasing the available supply for overseas use. It also accomplished the equally important matter of conserving farm labor—most vital of all labor—for upon the products of the farm were depending the fighters and the men behind the fighters.

The ultimate goal and ideal of rural express service will be reached when on all main highways every farmer's gate is his shipping platform—for the produce which he sends out and for the supplies he receives from the city on the return trip of the express.

To carry the idea of highways transport and its various functions into all sections of the country and reach even the remotest parts, state highways transport committees were formed and under these still smaller sub-committees. In this work we had the splendid cooperation of the state councils of defense, who took the matter up in the states and secured representation of the Highways Transport Committee there. Through these state committees the messages of rural express, short hauls to relieve the railroads, return loads, etc., were brought closer to those concerned and permitted a much broader working organization.

Nineteen hundred and eighteen marked the gathering of a unique conference of the Highways Transport Committee at Washington, for this was a meeting of men with a real altruistic interest in highways transportation—in seeing the greatest possible amount of assistance accrue to the nation in helping carry out the war program as dependent upon the highways. Some of the most representative and prominent men were there from all parts of the Union, representing state highways transport committees and other closely allied organizations. It was the first meeting of the kind ever held in this country.

Men of national prominence located at Washington gave their inspiring views of the present and future possibilities of transportation over the highways. Among them were such men as Mr. Hoover, Secretary Lane, Secretary Redfield and Mr. Edward Chambers, of the Railroad Administration. Splendid suggestions were secured for cooperation with the various departments concerned and how the man from Oregon, the Highways Transport Committee in California, enthusiasts from Colorado, Alabama or Massachusetts could get behind the whole plan and make their efforts count.

The rural express was of peculiar interest to Mr. Hoover. Secretary Lane's plan of farms for returned soldiers embodies the construction of highways connecting these farms with each other and with neighboring communities. Mr. Redfield, as Secretary of the Interior, was naturally greatly interested in the development of our highways transportation, and the correlation of our three great modes of transportation—railroads, both steam and electric; our great system of inland waterways; and our highways. Throughout the conference the idea was uppermost of the great value of our highways to the railroads and the waterways, for the highways both lead to and from these other mediums and must be depended upon to feed them at the one end and be ready at the point of delivery to take the shipment to its final destination via the highways.

One result of the conference was the new interest injected into the work. Realizing that the men directing affairs at Washington were deeply interested in this program and its accomplishment, these men went back to their states with new visions of what might be accomplished. And the results of their work are showing now in the aroused interest of the country in developing this asset.

At the time of the signing of the armistice, road construction had largely been discontinued, although maintenance of the most important connecting and main highways had been assured. This was especially true where war supplies were being shipped by highway, eliminating much delay in re-handling at terminals.

Special emphasis might be laid upon the breadth of scope of work accomplished. While only a start was made, and while highways transportation is barely on the threshold of its possibilities, national interest has been aroused and centered on the problem. What we want now is a bigger, broader viewpoint of the whole problem—a national conception, not state or local—and a national system of highways, as necessary and useful as are our national and transcontinental railroads. What we want now are open, soundly constructed highways, built with a view to the highways transportation of the future—365-day roads, if you please.

◆

The Highways Transport Committee in Peace

A Description of the Organization and Work of the Committee, with an Outline of Its Plans for the Future

By JOHN S. CRAVENS

Chairman, Highways Transport Committee, Council of National Defense

The Highways Transport Committee of the Council of National Defense, as is well known, was organized to assist in the relief of traffic congestion brought about by conditions of the war. The story of its earlier activities can better be told by those more intimately associated with its work during the war period. This article is intended to set forth the relations of the Committee to its work during the after-war period, and the personnel and organization for this purpose.

At the time of the signing of the armistice, one of the original members of the Committee had died, and shortly thereafter the remaining members resigned, not because they felt that the usefulness of the Committee was at an end, but because the necessities of their various business callings demanded their attention, as they had given abundantly of their time to the work during the war.

In December of 1918, the writer was asked to succeed Mr. Roy D. Chapin as chairman, the latter having found it necessary to return to the conduct of his own business affairs. It was clear at that time that there were still fields in which the committee could labor to good advantage, and the first problem was to determine the best composition of the Committee for its new labors.

There seemed to be three principal channels in which the Committee might be of great value to the general public, the first being the continuation of the development of means of stimulating food production by providing better transportation; the second being a further study of the short-haul problem, particularly in relation to densely populated commercial and industrial sections; and the third being the co-ordination of the development of motor transportation with existing mediums of transportation in order that the public might be best served. These general subdivisions naturally led into the study of secondary and related problems. A fourth field of usefulness of the Committee might be designated as a study of the traffic laws of the various states, and the safety traffic regulations, in order that an effort might be made for uniformity in these particulars. A thorough consideration of the subject led to the conclusion that the purposes of the committee would be best served, and the best results for the public interest obtained by constituting the committee of representatives of those federal departments most interested in highway development and use. As a result, the following named gentlemen were invited to become members of the Committee, and now compose the Highways Transport Committee of the Council of National Defense:

John S. Cravens, Chief of the Federal Agencies Section, Council of National Defense, Chairman; James I. Blakslee, Fourth Assistant Postmaster General; J. M. Goodell, Consulting Engineer of the Bureau of Public Roads, Department of Agriculture; J. H. Collins, of the Bureau of Markets, Department of Agriculture; and Dr. R. S. MacElwee, Assistant Chief, Bureau of Foreign and Domestic Commerce, Department of Commerce.

Hon. Grosvenor B. Clarkson, Director of the Council of National Defense, is ex-officio a member of the committee. Chas. W. Reid is executive secretary, and L. L. Robinson is director of organization and education. These latter two gentlemen have been associated with the Committee for a long time.

The Committee does not undertake the study of engineering problems of road construction, nor does it establish truck lines of any form itself. It does not undertake to determine where, when or how roads should be built. It is an advocate of road improvement, and in general it may be said that its principal function is to educate the people to what roads, properly improved, maintained and used, can mean in the country's economic growth.

In addition to the active work that it undertakes, the Committee acts as a clearing house for all state highway departments, state transport committees and other bodies interested in road development and use, in order that the story of valuable developments in any one locality may be made available to all other localities.

Perhaps the most important single work that is to be carried on as a peace measure is the study of the development of rural motor express. Through state transport committees, chambers of commerce and like bodies, a survey is made, which will disclose the districts in which large unproductive areas exist because of the lack of transportation facilities. A study is then made as to the form of motor transportation that will operate to bring such areas into production, and the findings are laid before those who might be interested in the establishment of motor truck service. In matters of this kind the Post Office Department and the Department of Agriculture, through their representation on the committee, take active interest and are able to give valuable suggestions. It is well known that there are many localities in the country where great quantities of food are produced which never reach the market, by reason of the lack of transportation. It is estimated that less than 50% of the green food produced in the country ever reaches the consumer. The stimulant to continue such production by means of affording an access to markets will be one of the great factors in the production and cheapening of the food supply of the nation.

The second and third of the present activities of the Committee are very closely related. It is a more or less mooted question as to what is the value of the short haul to the railroads, and a further question as to what extent railroads will be justified in the construction of spur or feeder lines. The committee undertakes to make a study of these problems in order that the economic field of usefulness of the truck and rail transportation may be definitely established. Certainly there comes a point when the economic usefulness of the one will begin and the other terminate. In work of this kind the Committee is operating in close association with officials of the United States

(Continued on page 61)

Trailers and Trucks for Highway Hauling

How the Trailer Solves Special Haulage Problems, Reduces Road Repair and Maintenance Costs and Cuts Down the Cost of Highway Transportation

By HARRY WILKIN PERRY,
General Manager of the Trailer Manufacturers Association of America

Within a few years the trailer has come into prominence as a new agency in highway transportation. It has demonstrated possession of so many advantages that it promises not only to come into very general use, but to stimulate a more rapid introduction of motor trucks. The trailer makes it possible, under favorable conditions, to utilize the surplus or reserve power of the motor truck and the passenger automobile in a way to further reduce the cost of transportation without increasing the size and weight of the individual unit. Thus the truck owner is able to do his hauling or delivery work at lower cost per ton-mile or per package, without any resulting greater wear and tear on the highway.

On hard, fairly level roads any motor truck has power enough to haul at least one trailer carrying a load equal to a capacity load on the truck itself. Under some conditions it can haul two or three loaded trailers in addition to its own load. This is possible because every motor truck is powered and geared to carry its maximum rated load up grades of 20% or more on poor roads. When operating on hard-surfaced roads and slight gradients, all of its power is not required but can be utilized for drawing one or more trailers. This reserve power can thus be translated into draw-bar pull just as the power of a locomotive, except that required to move itself and its tender, is expended in draw-bar pull to haul the long, heavy trains of freight cars or passenger coaches.

HIGHWAY TRAILER AND PACKARD TRUCK USED BY CREAMERY.

Truck's Ability to Pull Trailers.—The amount of tractive effort developed by a truck can be ascertained by formula or by charts already worked out for the purpose. This tractive effort, in pounds, divided by the road resistance in pounds per ton under given conditions of road and grade, will show the total number of tons that can be moved by the truck. Subtracting the total weight of the truck itself and of its rated load capacity shows the number of tons of trailer and trailer load that can be hauled through the draw-bar pull.

The road resistance of rubber-tired trucks and trailers has been determined by tests. It varies from 20 lb. per ton on asphalt to 50 lb. on hard clay or gravel, 75 on soft macadam and 150 on ordinary country sand roads. In addition to the road resistance on the level, a draw-bar pull of 20 lb. per ton is required for each 1% of grade ascended. Thus, a 5% grade requires 100 lb. of tractive effort of draw-bar pull and a 10% grade requires 200 lb.

Why Trailer Operating Expense Is Low.—By utilizing the reserve power to pull a trailer, the work capacity of the truck is doubled. There is, however, a resulting increase in the gasoline and oil consumption and in other operating expenses. While this increase in cost of operating varies with conditions, it has been found to be about 20% in normal service, so that the load on the trailer is hauled at a saving of about 80% as compared with hauling the same load on the motor truck.

The principal savings in trailer operating expense are due to the facts that an extra driver is not needed, interest on the investment is very low, consumption of fuel and oil per ton hauled is only a fraction of that of a truck operating alone, depreciation of the trailer and increased depreciation of the truck is relatively small and the wear of the trailer tires and increased wear of the truck tires is low per ton.

WARNER TRAILER EMPLOYED IN HEAVY COMMERCIAL HAULAGE.

Idle Time of Truck Cut Down.—It is not, however, in straight hauling alone that the advantages and economy of the trailer are shown. Much of the expense of hauling by motor truck or team is due to long waits while loading and unloading. It is an axiom in the motor truck industry that the truck must be kept moving if it is to save or earn money for the owner. The reason for this is plain when it is considered that the cost per ton-mile increases as the mileage covered per day decreases. If, for example, a 5-ton truck costs $30 a day to operate, including all items of expense, and in a 10-hour day travels 50 mi. with full load, it performs 250 ton-miles service and the cost per ton-mile is 12 ct. But if it is kept standing during half the day while being loaded and unloaded, and travels 30 mi. with full load, its performance is 150 ton-miles, at a cost of 20 ct. per ton-mile—an increase of 66 2-3% in haulage cost.

There are many lines of business in which loading and unloading take a great deal of time. One is the lumber trade. In making up a load in the yards the lumber is passed from the piles piece by piece and an hour or two may be spent in the operation. Not infrequently the same tedious method of unloading is employed, to save breakage or for want of a quicker method. Obviously, a motor truck alone is of doubtful economy in such work as compared with horses, for the horses can be unhitched and the wagon left to be loaded while another wagon, loaded and waiting, can be hitched up and hauled away for delivery. Now, with a motor truck and several trailers or semi-trailers, this time-honored custom can be continued and at the same time great economy effected, because of the superior speed of the truck and trailer on the road as compared with horses and the greater load capacity of the outfit. One or more trailers or semi-trailers can be left in the yard for loading while the truck is making a delivery with a load. If, as is often the case, the bed of the trailer or semi-trailer is fitted with rollers, the entire load can be discharged as a unit in a few minutes instead of piece by piece. The semi-trailer possesses certain advantages in the lumber business, as the tractor-truck which hauls it does not carry any load itself and consequently never has to stand while being loaded.

Method Applied to Many Lines of Business.—This method of using trucks and trailers or tractor-trucks and semi-trailers is applied with equal success and economy in the building material, grocery, dairy, textile, heavy manufacturing and innumerable other lines. In the collection of cans of milk for haulage to dairies, the use of a truck and 4-wheeled trailers is most advantageous, as a trailer can be left at one point along the route for loading while the truck proceeds further on to pick up its own load. On the way back, it hitches on the trailer and hauls the double load to the creamery or dairy. A similar plan is in use in the retail coal trade, where coal is delivered to private residences and must be carried in in sacks or baskets.

Economical in Road Construction.—Trailers have been used for many years in road construction work; in fact, it is a question if the specialized trailer of today is not actually a development from the use of dump wagons with steam traction engines and road rollers in highway building. It is not at all uncommon for trains of three or more trailers to be used on large road contracts. Here the expense is further reduced by the employment of quick loading and unloading devices. Crushed stone, gravel or other road material is discharged by gravity from elevated bins or pockets, from side-dump cars on raised contractors' railways, or by steam shovels or cranes. The trailer loads are then dumped on the roadway from bottom, side or end dump bodies. No more efficient system than this can be employed. The cost of haulage per cubic yard is enormously reduced and construction is expedited to the maximum.

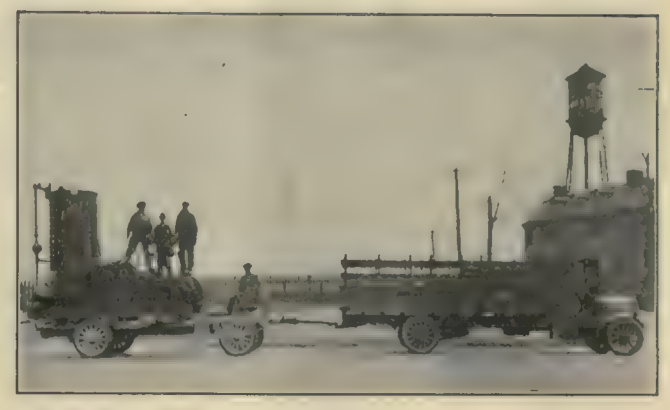
Solves Special Haulage Problems.—Some of the greatest advantages of the trailer are found in its adaptability to special haulage problems. There are definite practical limitations to the length of a motor truck which preclude its use alone for hauling extra long timbers, logs, structural steel, pipes, etc. There are also steam boilers, engines, tanks, stone columns, cornices, derricks, and so on, that are too big or too heavy to be carried on the truck itself. All of these can be handled readily by means of trailers. The 2-wheeled extension trailer supports the rear end of very long articles, while the forward end of the load is carried on the rear of the truck. Loads that are too heavy for the truck are thus divided between truck and trailer. In this way 30 and 40-ton weights are handled safely and much more quickly and with far less disturbance to traffic in cities than when 10 to 20-horse teams are used, as formerly.

Again, manufacturers in various lines have very light, bulky stuff to be moved. Barrels and boxes, for example, require as much body room on the vehicle when empty as when filled. Any truck made has power to carry several times as many barrels or boxes as can be loaded in its body. It can easily haul two or three trailers, each carrying as many pieces as the truck itself. The same applies to willow-ware and rattan goods, woodenware, toys, etc. So the cost of hauling such goods can be cut in half at least by the use of trailers.

Trailers in Rural Express and Farm Work.—Rural motor express lines that have sprung up by hundreds throughout the country during the years of the war have it within their

TROY TRAILERS WITH NASH "QUAD" TRUCK USED BY A HIGHWAY CONTRACTOR OF PHILADELPHIA, PA.

KING TRAILER AND WINTHER TRUCK HAULING LOGS.



WARNER TRAILER USED FOR HEAVY TRANSFER DUTY.

power to convert possible losses in operation into profit by the use of trailers to take care of excess business offered during the heaviest hauling seasons without making large investments in additional trucks that would stand idle in the light winter and spring seasons. Their problem is to take care of all business originating along their routes without having costly equipment standing idle a large part of the time. Trailers cost about one-quarter as much as motor trucks of equal capacity and their rate of depreciation when standing is much less than that of trucks, hence it costs very little to let them stand idle.

Light trailers and semi-trailers are coming into use by farmers, who are today generally owners of passenger automobiles and realize better than ever before the importance of spending as much of their own time on their farms as possible. Scarcity of farm labor, high wages, and the urgency of increased food production are important factors in this matter. In the light trailer of 500 to 1,000 lb. capacity, designed to be coupled to a light motor car, the farmer finds an inexpensive means of hauling to market with the least loss of time on the road; in fact, it is common to let one of the women or boys drive the car to town with a trailer load of poultry, eggs, butter, garden truck, berries or other stuff for sale. These light trailers are made in 2-wheeled and 4-wheeled types and equipped with pneumatic or solid rubber tires so they can travel at high speed without damage to the trailer or deterioration of the load. Thus, perishable produce reaches market in the best possible condition and commands the highest prices.

For hauling the heavier and larger loads of principal farm products the 2, 2½ and 3-ton trailers of the 4-wheeled type are used in conjunction with trucks of corresponding capacity. It is desirable at times to rush as much grain, fruit, pigs or vegetables as possible to market to take advantage of high prices and good weather and road conditions. This the truck and trailer combination provides for, as double the quantity can be hauled at one time and a trailer can be left at the farm for loading while the truck and another trailer are making the trip.

The examples given indicate the diversified applications of trailers to haulage problems. Many others might be cited, but it will suffice to say that one make of trailer alone is now in successful use in more than 200 lines of business with 86 different makes of trucks. It is not known how many trailers are in service in the United States, but there are more than 2,200 in New York State, and the rate of increase last year was more than 50%.

Trailer Takes Care of the Overload.—It is important to bear in mind that the trailer takes care of the overload. It is ruinous to the motor truck to be overloaded frequently, and it makes the cost of operation excessive if an unnecessarily large truck is used half the time or more hauling less than capacity loads merely to be available for hauling the occasional larger loads. It is far more economical to use a smaller truck for the ordinary loads and provide a trailer to handle the excess loads when necessary.

Costs of haulage with trailers vary so much, according to conditions of operation, materials handled, size of truck or trailer, roads and driver, that no general statement can be made, and space forbids giving detailed statements here from various users. It may be said, however, that in many cases the cost per ton-mile has been reduced nearly or fully one-half, and in some cases more, while of course, in others it is less.

Effect on the Highways.—Not only road commissioners and engineers, but truck operators themselves, should be interested in the effect that the growing use of trailers will have on the highways. During recent years there has been a notable tendency among the states to legislate against the operation of heavy trucks because of the damage it is claimed they do to the highways. As a matter of fact, it is yet to be determined by scientific tests and data whether

TRAILMOBILE AND REPUBLIC TRUCK CARRYING HOGS TO MARKET.

TROY TRAILER WITH PIERCE-ARROW TRUCK IN ROAD WORK.

they actually damage the roads relatively more than high-powered passenger automobiles and heavy horse-drawn wagons with narrow, iron tires, which destroy the surface of the roads, cut deep ruts and thereby allow water to soak into the base and foundation.

Without entering into a discussion of this, it may be pointed out that a load of 10 tons carried on a truck and semi-trailer has the weight distributed on three axles and six wheels and when the weight is divided between a truck and trailer a load of only 5 tons is placed on each 4-wheeled unit. Moreover, the gross weight is extended over a materially longer wheel-base and is not concentrated on a single span of a light bridge. Thus, the weight concentrated at any point tending to crush the base or foundation of the road or to break the bridge is very much less than when an equal load is carried on one truck. Impact of the individual wheels is also less, so there is not the same effect of pounding down into surface depressions and enlarging them until deep holes are formed and the base breaks through.

Tractive Effort Responsible for Surface Damage.—Surface damage is caused more by tractive effort than by concentrated weight on rubber tires. For this reason, the drive wheels of motor cars and trucks and the horses' shoes do more harm than the free rolling wheels of the vehicles. No tractive effort is applied to the wheels of trailers, and less tractive effort is exerted through the drive wheels of the truck to pull a given load on a trailer than if the same load were carried on the truck itself, because the trailer weighs less than the truck. Tires on trailers give two to three times the mileage of tires on trucks of equal capacity. Greater weight per inch width of tire can, therefore, be carried on trailers than on trucks, with no more wear of the road surface. As the possibilities and advantages of trailers are more widely understood and their use becomes more general, it is believed the tendency will be to use smaller sizes of trucks, in combination with trailers, rather than the heavier trucks by themselves. This will lessen road damage and it is hoped will have its effect in convincing the authorities that excessive motor vehicle taxation and restrictive limitations are unnecessary.

Good roads are highly essential to economic highway transportation and are as much to be desired by the general public as by the operators of motor trucks, inasmuch as the public always pays the cost of haulage in the end. If roads are bad and haulage costs are high, the consumer pays more for what he gets. Similarly, if truck taxation is excessive, the amount of the tax must be added by the truck owner to the cost of hauling or to the prices of his goods, and the public pays the bill. So, in the final analysis, it is for the public to decide whether it prefers to pay for suitable motor truck roads that will reduce the cost of haulage or continue to pay the high cost of living.

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Uses of the Motor Truck in Highway Work

Road and Street Contractors and the Highway Departments of States, Counties and Cities Find Many and Varied Uses for Trucks and Trailers in Road Construction and Maintenance

Though the motor truck and the trailer have created many problems for road builders to solve, they have also been of very great use in surmounting of some of the difficulties encountered in construction and maintenance work. Road and street contractors have long looked upon motor trucks —and to a great extent, trailers also—as essential parts of their equipment; and state, county and municipal highway departments have followed suit. Today there are few contractors who are not truck users, and practically all road and street departments maintain trucks for the use of their maintenance and repair forces.

On almost every road or street job the hauling of materials is a large part of the work. Until the motor truck came into use, teams were used almost entirely. Now, the truck, alone or in conjunction with trailers, is used, chiefly to bring material to the job, but also for hauling away from the job and for transporting material from one part of the work to another, as in cut and fill.

Another transportation problem for which the motor truck frequently furnishes the solution is the moving of plant from place to place on the job or from one job to another. One of the illustrations on the opposite page shows a Packard truck and a Fruehauf trailer utilized in this way. The equipment in this case is an industrial locomotive that has been used for transporting material in the building of a concrete road and is to be similarly utilized on another job at some distance from the first.

Carrying laborers to and from work is another part of road work in which the truck has demonstrated its usefulness. During the past few seasons, when labor has been hard to obtain and expedients of all sorts have had to be adopted, more than a few contractors have solved their problem by employing trucks to collect their laborers in the morning and take them back at night. Many road authorities have also employed this means of utilizing the labor of inmates of penal institutions at a distance from the roads, instead of maintaining convict camps.

The manner of using trucks in road work is, of course, a special problem in each given case. As a general rule, the truck is an economical and efficient machine, but there are naturally certain conditions under which its use is not advisable. And in almost any given instance, its effectiveness and the cost of operating and maintaining it depend altogether upon the way in which it is used. This is a factor of very great importance. Putting a truck, or a fleet of trucks on the job, without regard to the method of operation, can not be expected to result in better work or lower costs. On the other hand, the intelligent employment of the motor truck can usually be made profitable.

While the principal use of the truck in road building is in the carrying of materials, equipment or laborers, its utility by no means ends there. It has proved its value in many other parts of the work.

One of these is the operation of road machinery of various kinds. In one of the accompanying illustrations, a truck is shown drawing a drag. In addition, scrapers, scarifiers, distributors, sprinklers and other machines are frequently operated by means of trucks.

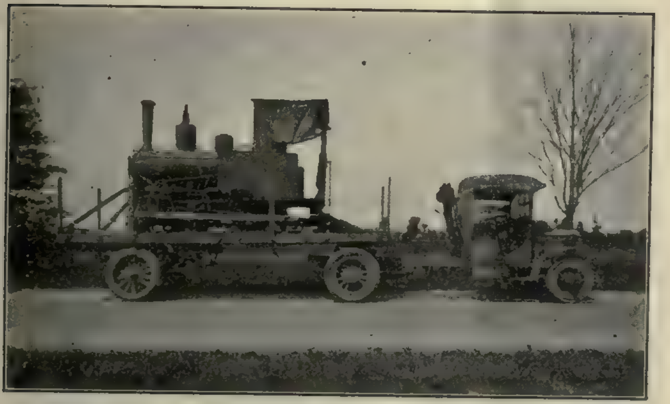
Another common use of the motor truck is its combination with tanks and distributing apparatus to form sprinklers and bituminous material distributors. Machines of both types are illustrated herewith. Another and somewhat similar use is in motor-driven street sweepers and cleaners.

One of the latest uses of the motor truck in road work is in snow removal. Not only are trucks used alone and

(Continued on page 62)

Service Truck Hauling Road Machines.

Packard Truck Hauling Material.



Packard Truck and Fruehauf Trailer.

Gary Trucks for Road Work.

Autocar in Snow Removal.

Nash Trucks for Road Service.

Mack Distributor Truck.

GMC Sprinkler Truck.

VARIED USES OF THE MOTOR TRUCK IN ROAD AND STREET WORK.

Hauling Over the Highways With Motor Trucks

Various Services Performed by Motor Vehicles in Rural Motor Express and Intercity Hauling—Examples and Cost Data

A good many years ago the highways of America were the chief and almost the only avenues of freight and passenger travel. Where there were rivers, lakes or canals, boats took care of the bulk of the long-distance transportation, but elsewhere pack and wagon trains had to suffice for the needs of industry and commerce. Then the railroads came and gradually absorbed the business of carrying freight and passengers and the roads were abandoned except for the short haul to the railroad, the river or the canal and the intercourse between the market town and the farms in the surrounding country.

This condition remained unchanged until about a quarter of a century ago, when the bicycle came into vogue and its users demanded better roads. A few years later the automobile reached a point in its development when it became a practical pleasure vehicle and there arose a still more insistent demand for good roads.

FEDERAL TRUCKS OF THE HIGHWAY RAPID TRANSIT, A LINE BETWEEN PORTLAND AND SALEM, ORE.

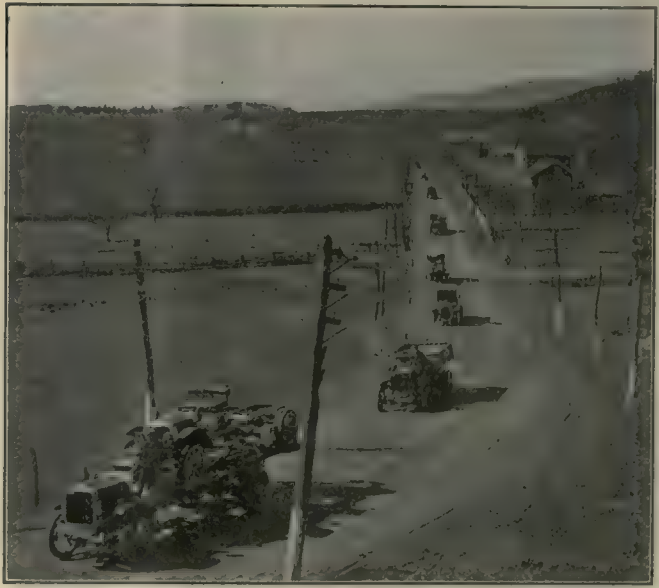
Up to that point the call had been for roads for recreation, both the bicycle and the automobile being merely pleasure vehicles at first. Popular sentiment, however, was sufficiently strong to force a beginning in the betterment of the country's highways and to stimulate study of the technic of road construction and maintenance.

The third and deciding factor in the creation of a demand for road improvement was the motor truck. When the Great War commenced, the truck had been developed to a high state of efficiency, but its use—probably to a very great extent because suitable country roads were lacking—was limited to cities and towns and to short hauls in the immediate vicinity of thickly populated centers. The war imposed unusual burdens upon the country's railroads—burdens so great, in fact, that railroad transportation proved inadequate and shippers turned to the truck and the partly forgotten and almost totally neglected highways for relief.

How the truck met the test is an old story now. But meeting the emergency of war, though an achievement of incalculable value, is not the greatest result of the truck's entry into the transportation field. Its establishment as a transportation agency in peace will have results of far greater importance. Already, hauling by motor truck over the highways has taken an enormous tonnage of short-haul business from the railroads, and, as road improvement goes on, the length of economical and efficient haul will increase—to what limits it is impossible to predict.

In the following paragraphs are cited various instances illustrative of the increasing utility of the motor truck in rural motor express, inter-city hauling and other fields.

One of these is the use made of the country's highways by motor truck manufacturers in delivering cars and trucks. This practice, which first attracted public attention during the war through the "drive-aways" of Army trucks for shipment overseas, has been continued in the making of ordinary deliveries to dealers. One of the accompanying illustrations shows a string of White trucks on the way from the factory at Cleveland to Philadelphia. The photograph from which the illustration was made was taken on a portion of the Lincoln Highway.



DRIVE-AWAY OF WHITE TRUCKS OVER THE LINCOLN HIGHWAY FROM CLEVELAND TO PHILADELPHIA.

An especially striking example of the importance of good roads as a factor in economical performance is afforded by the experience of the American Freight Corporation of Philadelphia, Pa. The profit earned by one 5-ton Pierce-Arrow truck operated on a daily schedule between New York and Philadelphia more than paid for the cost of the truck during the first twelve months of service, according to data furnished by the Pierce-Arrow Motor Car Co. This was accomplished at rates 18% lower than the railroad express rates and, of course, much better service was furnished in less time. The distance between the cities is approximately 100 mi. and the trip was made in 7 hours, carrying a full 5-ton load each way. The truck was purchased in March, 1918, and has been in continuous service, covering nearly 40,000 mi. during a year of operation. Three round trips were made weekly. Sometimes a fourth trip

PIERCE-ARROW TRUCK OPERATED BETWEEN NEW YORK AND PHILADELPHIA.

CORBITT TRUCK OPERATED BY THE GOODYEAR TIRE & RUBBER CO. AT CHARLOTTE, N. C.

was made, and once in a while the truck made five trips in a week. The truck is equipped with a van body, and hauls hides, talking machine records, candy, newspaper supplements and miscellaneous merchandise. The gasoline and oil consumption is given at 1 gal. to 5.25 mi. and 1 gal. to 200 mi., respectively. Detailed costs are given as follows:

Cost of truck and body		$5,800
Fixed charges:		
Interest at 6%	$348.00	
Insurance (fire, property damage, collision and liability)	331.20	
*Garage	75.00	
Driver's wages, $45 weekly	2,340.00	
Total fixed charges		$3,094.20
Fixed charges per day	$8.47	
Operating charges:		
Tires (20,000 mi. at $581)	$0.0290	
Gasoline (5.25 mi. per gal. at $.25)	.0470	
Oil (200 mi. at $0.60 per gal.)	.0030	
Lubrication allowance	.0013	
†Repair and maintenance ($500 for 40,000 mi.)	.0125	
Depreciation (150,000 mi. minus tires)	.0348	
Operating cost per mile	$0.1276	
Total fixed charges	$8.47	
Total operating charges on basis of 100 mi. per day	12.76	
Total average daily cost	$21.23	

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*Garage rented only three months; truck worked 20 hours per day for nine months and no garage was used.

†Cash spent for repairs was actually $16, but liberal allowance is made for impending overhaul work.

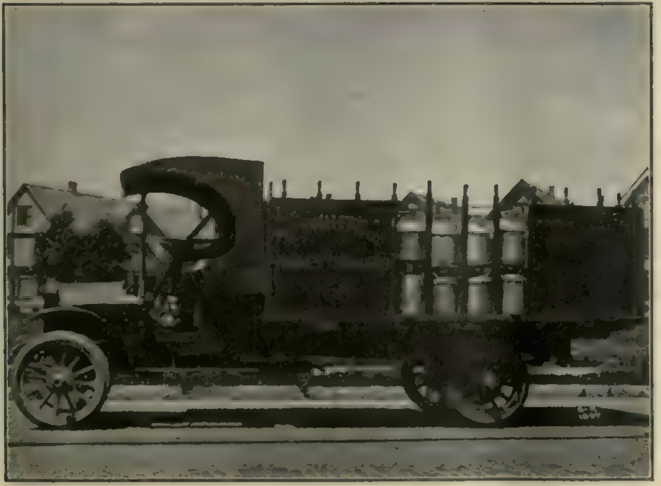
A 1-ton Corbitt truck has been operated by the Charlotte, N. C., branch by the Goodyear Tire & Rubber Co. since July 15, 1918. The following data, covering operation up to February of this year, is furnished by the manufacturers:

In 200 days of operation the truck was run 2,971 mi. or an average of 14.65 mi. daily. The tonnage hauled was 1,172,887 lb., or an average of 5,865 lb. daily. The cost of operation is given as follows:

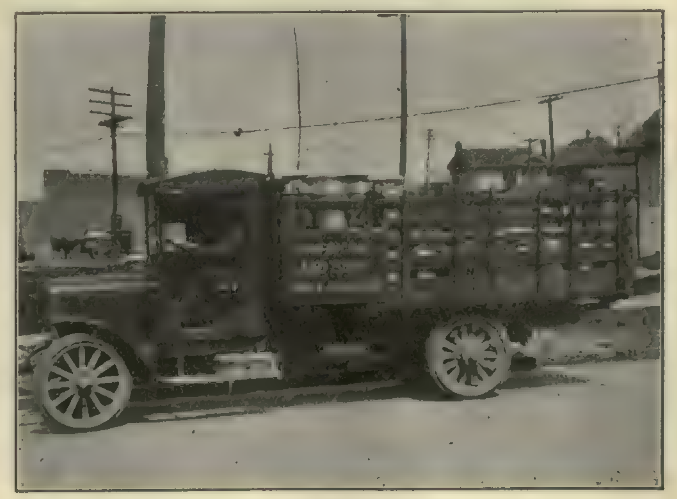
Gasoline, 426 gal	$109.50
Oil, 6.25 gal	5.50
Grease	2.85
Repairs	3.93
Total	$121.78
Average cost per mile	$0.0490
Average cost per 100 lb	0.0103

The transportation of foodstuffs is one of the most important uses to which the motor truck is put. An instance of this is the hauling of milk. One of the accompanying illustrations shows a 2-ton Acme truck operated by John Dickie & Sons, of North Farmington, Mich., to carry milk to Detroit, a distance of 50 mi. The truck has been in continuous operation for 15 months and the load carried, according to Mr. Dickie, is never less than 2 tons and often considerably more. In addition, another ton is hauled on a trailer a part of the time. The owners state that the truck does in five hours what it would take four good teams all day to accomplish, and that, furthermore, the work could not be done profitably with horses. The entire trip is made over good roads, mostly of cement concrete.

A similar use of the motor truck is shown in the illustration of the Diamond T truck used to haul milk to Milwaukee. This truck is a 2-ton machine owned by T. J. White of Hales



ACME TRUCK USED FOR MILK DELIVERY, NORTH FARMINGTON TO DETROIT, MICH.



DIAMOND T TRUCK USED TO HAUL MILK TO THE CITY OF MILWAUKEE, WIS.

GRANT TRUCK LOADED WITH HOGS FOR MARKETING IN CLEVELAND, OHIO.

TITAN TRUCK USED IN INTER-CITY WORK BETWEEN CHICAGO, ILL., AND MILWAUKEE, WIS.

Corners, Wis. Many other operators have engaged in the same business and as a result, it is stated, the cost of milk in the city of Milwaukee is two or three cents cheaper than it is in other large cities of the Middle West.

Another instance of the utilization of the truck to carry foodstuffs is furnished by the employment of a 1½-ton Grant truck to carry cattle from Berlin Heights, Ohio, to the market at Cleveland, 55 mi. away. The entire route, with the exception of about 3 mi., is over paved roads. The running time is about 3 hours, according to the owners of the truck, and the round trip costs about $14. The cattle shown on their way to market were sold in Cleveland for $360, which was $120 more than they would bring in Berlin Heights.

A motor truck line operated between Portland and Salem, Ore., was described in a paper presented by F. W Fenn, Secretary of the Motor Truck Committee of the National Automobile Chamber of Commerce at the annual meeting of the National Highway Traffic Association in New York last May. The paper was printed in "Good Roads" for June 7. This line is 55 mi. in length and is known as the Highway Rapid Transit. It is operated by E. B. Scott, the son of Capt. H. B. Scott, who commenced the operation of a light-draft steamer on the Willamette River, between Portland and Salem in the 70s. Three Federal trucks are used, one 2-ton and two 3½-ton machines. The round trip is made in 24 hours and the freight rate ranges from 30 to 40 ct. per 100 lb. Various commodities are carried, including milk, butter, eggs, vegetables and other foodstuffs. Except for about 20 mi. the route is over good roads.

Another inter-city express line is operated by the Donaldson Transfer Co., of Milwaukee, Wis., between that city and Chicago. The illustration shows a 3½-ton Titan "Hi-way" transport machine equipped with pneumatic tires in front and solid dual tires in the rear. The Donaldson Co. also operates 5 and 6-ton trucks over the same route.

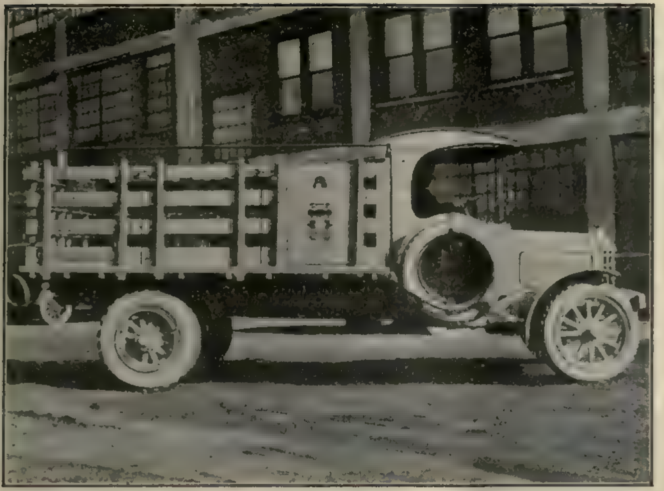
A truck and trailer unit is used by the Commercial Trucking Co., of Ann Arbor, Mich., for hauling between that city and Detroit. The unit consists of a 2½-ton Lane truck with a King S-5 semi-trailer. Daily trips are made, the load carried consisting of eggs, meat, and other packing house products and miscellaneous freight. The round trip distance is about 80 mi. and the outfit makes a daily average of about 100 mi. The outfit carries a load of about 7½ tons and uses about 15 gal. of gasoline daily, as against a load of 4 tons and 14 gal. of gasoline daily when the truck was used alone.

Another example of inter-city motor truck hauling and also of the use of trailers is shown in the photograph of a part of the fleet of Mack trucks, operated by the Heavy Haulage Co., of New York, N. Y. This company is one of the largest of its kind in the country and does a general trucking business in New York and vicinity.

The Champion Spark Plug Co., of Toledo, Ohio, use a 2½-ton Garford truck to deliver plugs to the Ford, Studebaker and Maxwell plants at Detroit, and to the Fordson plant at

LANE TRUCK AND KING S-5 TRAILER IN SERVICE BETWEEN ANN ARBOR AND DETROIT, MICH.

MACK TRUCKS OPERATED BY THE HEAVY HAULAGE CO. OF NEW YORK CITY.



GARFORD TRUCK USED FOR HAULING SPARK PLUGS FROM A TOLEDO FACTORY.

F. W. D. TRUCK CARRYING GASOLINE IN THE SEQUOIA GROVE OF CALIFORNIA.

Dearborn. Daily trips are made, the truck leaving Toledo at 7:30 a. m. and reaching its destination 68 mi. away in 3 hours and 40 minutes. Before starting on the return trip to the factory the truck is loaded with porcelain at the Champion Company's Detroit plant and is back in Toledo at 6:00 p. m. The distance covered each day, according to the company, is never less than 136 mi., and the time for the round trip, including stops, never exceeds 10½ hours. About 9 mi. per gallon of gasoline and about 95 mi. per quart of oil has been the average consumption. The truck, as will be noted by reference to the illustration, is equipped with pneumatic tires.

During the past few years long distance moving by motor truck has become an every-day occurrence. One of the accompanying illustrations shows a Hall 2-ton truck with pneumatic tires operated by the Sheahan Van & Storage Co. This machine is used for moving between Detroit and the cities of Cleveland, Dayton, Columbus and Toledo, Ohio, and the towns in Michigan and Ohio within a radius of 125 mi.

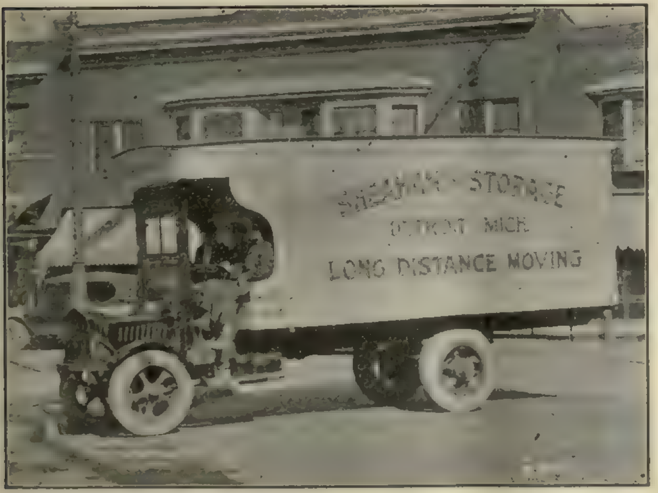
In order to promote good roads in the vicinity of St. Louis and also to demonstrate the practicability of motor truck transportation, the St. Louis Manufacturers' and Dealers' Association recently conducted a 400-mi. demonstration tour participated in by 33 trucks. One of the accompanying illustrations shows two Traffic trucks, equipped with pneumatic tires, photographed after the completion of the trip. The tour started on Monday, June 9, and lasted 5 days, traversing St. Charles, Lincoln, Ralls and Marion Counties in Missouri, crossing the Mississippi River at Quincy, and returning to St. Louis via Beardstown, Alton, and Jerseyville.

Good Roads Save Money

Users of Improved Roads in Milwaukee County, Wisconsin, Benefited to Extent of $25,000 a Day

The users of the improved roads in Milwaukee County, Wisconsin, benefit to the extent of $25,000 a day, according to a statement furnished to the Bureau of Public Roads of the United States Department of Agriculture by the county commissioner of highways.

The estimate is based on a yearly traffic census taken during the past four years. The count is made by selecting 52 points throughout the county and recording traffic at each one for every day in the week. The counts are not made on consecutive days but on various days from April to November, in order to arrive at average conditions. According to the statement by the Department of Agriculture, the census shows that about 25,000 vehicles of all kinds use the highways each day. It also shows that traffic has increased about 42% a year during the four years in which a count has been made.



HALL TRUCK USED FOR LONG DISTANCE MOVING IN MICHIGAN AND OHIO.

TRAFFIC TRUCKS AFTER COMPLETING ST. LOUIS DEMONSTRATION TOUR.

Influence of Motor Traffic on Road Design

Preliminary Studies for the Designing of Main Interurban Motor Transport Roads—Transportation Surveys, Laws and Regulations, Widths, Grades, Curves, Bridges, Drainage and Foundations, Wearing Surfaces, Detours and Other Considerations

By ARTHUR H. BLANCHARD
Consulting Highway Engineer

A. H. BLANCHARD.

Due to the phenomenal development of highway transport in the United States during the past three years and its probable growth in the near future, the economic design, construction and maintenance of highways must be based upon a consideration of the effect of motor transport on the several component parts of a highway. Although the development of highway transport in the United States was accelerated by the necessities of war and certain transport methods were evolved, due to the conditions of war-time transportation by railway, waterway and highway, nevertheless many methods which were employed are applicable to peace conditions. The tendency among certain individuals and in some communities to minimize the importance of motor transport as an important factor in the future transportation systems of this country should be discounted. Several rural motor transport methods were in use in the United States prior to the war and many were in full operation in England prior to 1910.

The status of motor transport in England in 1909 is aptly described in the following statement by Col. R. E. Crompton, M. Inst. C. E.

"Although our roads came first, and their development occupied the best thoughts of our leading engineers at the time of Telford, when railways were introduced, road development took a second place until quite recently, when it was seen that the general introduction of motor vehicles was rapidly bringing back the roads into favor, not only for carrying passengers and distributing material for short runs, but to act as feeders to the railways, and in many cases to become rivals to the railways themselves for short hauls, or, in fact, in all cases where economies in the terminal charges and in the packing of goods, especially those of a perishable character, can be effected by these goods being loaded at the starting point into a vehicle which carries direct to the consumer without trans-shipment or intermediate handling. The economical advantages of this last consideration are so great that many business firms have now found that they prefer to deliver direct, in their own vehicles, goods which they had hitherto to send by their horse-drawn vehicles to the railway stations and which had to be twice transferred, first from their vehicles on to those of the railway, and again from the railway vehicles to the railway vans. A study of the statistics of increase of traffic on roads radiating distances of at least 30 mi. from our large business centers has shown us that, as the vehicles and as the roads themselves are improved, this radius of direct haulage is likely to increase, and will probably have a very important effect on the distribution of the population, and must with absolute certainty be reckoned with in considering all questions of construction and upkeep of the roads themselves."

Motor transport is generally recognized as an important factor in highway design by highway officials and engineers having control of the construction and maintenance of highways of interstate, state and municipal systems. In a brief article, it is necessary to limit the consideration of the effect of highway transport on the design of highways. This discussion, therefore, will refer to short trunk highways connecting municipalities between which a large amount of commercial traffic has developed.

The problem of the design of a highway from the standpoint of motor transport resolves itself into a determination of the probable amount and character of motor vehicle traffic during an indefinite future period; the design of the grades, curves and width of the roadway so that it will be efficiently serviceable for the traffic which it is to carry; the determination of the amount and character of external forces for which the roadway, considered as a structure, must be designed; and finally, the design of the roadway so that it will have sufficient internal strength to resist the external forces during a reasonable period of time.

To determine the first element enumerated in the program outlined, it is evident that preliminary investigations should be made preceding the design of the highway and should be much more thorough than has been characteristic of past practice in most cases. The preliminary investigation should include a transportation survey, which should cover a thorough study of all phases of rural and interurban transportation, competing carriers on railways, waterways and adjoining highways, and all other factors which may affect the character and amount of traffic which the highway is likely to carry. The highway engineer should make the same kind of a transportation survey which is now generally admitted as advisable prior to the establishment of any transportation business. The engineer, however, must consider all the probable fields of development which will affect a given highway, hence his transportation survey will necessarily be broader and more thorough in character than is required in the case of a single business proposition. The classes of commercial motor transport requiring consideration include rural motor express, long and short haulage, inter-city haulage, utilization of trailers, and motor bus routes. Although it is self-evident that an exact determination of the amount and the character of motor traffic is impracticable, nevertheless a study of the agricultural, industrial and commercial resources of a given community, coupled with a knowledge of traffic development under similar conditions, will enable an engineer to determine the requirements much more satisfactorily than would be the case if no transportation survey were made. Such investigations should be as comprehensive as has usually been the case in reconnoisance surveys made prior to the building of a railway line. Private interests, whose business pertains to transportation by steam or electric railway or by waterway have always based the financial investment upon a thorough investigation of traffic potentialities.

Regulations which refer to weights, speeds and dimensions of motor trucks and trailers, rules of the road and motor bus routes, should receive special consideration during preliminary investigations. In some states legislation has been enacted which is expected to remain law for a considerable period of time, thus enabling the highway engineer to design the several classes of highways to carry the traffic allowed by state laws. In other cases the state laws appear to be the result of progressive educational work, with the result that the controlling factors are apt to be changed from year to year. Under these conditions the highway engineer must form his own judgment as to the probable future limitations which affect highway improvement. For highways, which up to the present time have been considered feeders to county and state highway systems, the regulation of the development of rural motor express and motor bus routes is of prime importance. Some states grant licenses for certain lines of transportation business, allowing only one license to be granted for a given line of business over a given route. There is no doubt but that within a comparatively short time both express and motor bus routes will be under direct control of state governments, and it is probable that interstate highway transport will sooner or later be regulated by the Interstate Commerce Commission.

There are many cases, in sections of the country where highway improvement has been under way for many years, in which the problem of the determination of the probable amount of traffic for which the highway should be designed is materially simplified. For a short highway between two cities, where the nature of the commercial and industrial activities indicates there will be a considerable amount of interurban traffic, certain definite requirements may be laid down with reference to the maximum weight and dimensions of motor trucks for which the highway should be designed. As an example of such requirements, there will be noted the following maximum limitations embodied in a resolution adopted at the 1919 convention of the American Road Builders' Association: Total gross load on four wheels, 28,000 lb.; load per linear inch of width of tire, 800 lb.; width, 8 ft.; over-all height, 12 ft. 2 in.; over-all length, 28 ft.; speed of trucks and trailers equipped with solid rubber tires, 15 mi. per hour. These limitations and the laws of several states allow the use of 7½-ton motor trucks. For the class of highway under consideration, the above limitations should be adopted as the basis for the design. In this article, it will be practicable to consider only certain fundamental facts which will serve as guides in the design of a highway for interurban traffic under the conditions noted.

Widths: For the interurban highway under consideration, two lines of commercial traffic will be considered as the minimum requirement. Roadways economically designed must provide for carrying the traffic on the paved roadway surface and not rely upon shoulders to carry a part of the traffic or serve as turn-outs. It has been demonstrated that the latter practice is not economical from the standpoint of the maintenance of the pavement or shoulders, nor is it efficient or safe from the standpoint of traffic using the highway. In order that a two traffic line highway should be satisfactory to all classes of vehicular traffic, it will be necessary to follow English interurban traffic practice which requires that slow moving, or in this case commercial traffic, shall keep to the side of the roadway. It is, however, obvious that a heavy motor truck operator will insist upon allowing a certain amount of leeway between the outside wheels of the truck and the edge of the roadway, as many operators have had unfortunate experiences with motor trucks being stalled in soft shoulders, or ditched. From observations of commercial traffic made on many highways outside of municipalities, it is the writer's conclusion that it will be necessary to allow at least 1 ft. clearance between the body of the truck and the edge of the paved roadway. Furthermore, these observations indicate that motor truck drivers, traveling at speeds from 10 to 15 mi. an hour, will endeavor to maintain a clearance of 2 ft. between passing vehicles. A consideration of the maximum width of 8 ft. for each of two trucks and the clearance suggested indicates that a minimum of 20 ft. for two lines of traffic is a conservative recommendation. It should be observed that the county highways of England and the national routes of France have been constructed with roadways having widths of not less than 20 ft., for many years. If the transportation survey indicates that the amount of traffic will require provision for more than two lines of vehicles, a greater width than 20 ft. must be adopted, the additional width depending upon the character of the traffic. It does not require much imagination to reach the conclusion that many interurban highways will be subjected, during the next decade, to traffic which will necessitate roadways sufficiently wide to accommodate at least two lines of motor trucks and two lines of passenger cars.

Grades: Only general deductions may be made pertaining to requirements relative to grades for motor transport. Unfortunately, few data are at hand covering the relative efficiency of truck transportation over various grades on different types of roadway surfaces. Of course, the general deduction may be made that the cost of haulage varies directly with an increase in grade and that the tonnage which can be economically hauled varies inversely with an increase in grade. In all probability the present fundamentals of grade design will not be modified until sufficient data have been accumulated to demonstrate that present practices are uneconomical either from the standpoint of motor transport or the maintenance of the roadway.

Curves: Motor vehicle traffic has effected a decided improvement in the design of highway curves, especially in the direction of the easing of sharp curves, provisions for clear sight around curves and the banking of roadways. The importance of these details will be accentuated by the development of motor truck traffic.

Bridges: A bridge is an integral part of a highway. It is to be regretted that this fact usually has not been recognized by lawmakers. Many highways are built of sufficient strength to carry the motor traffic to which they are subjected while the bridges are so weak that their condition prevents the use of the highway by a part of the motor truck traffic. Many citations may be given of highways which have had to be abandoned as commercial transportation routes due solely to the weak condition of the bridges. One reason for this condition is that many state laws provide for the construction and maintenance of roadways by the state, while the bridges are under the jurisdiction of counties or towns. It is self-evident that bridges of trunk highways connecting municipalities should be designed for loads of not less than 30,000 lb. and it would appear advisable, considering the character of the structure, to follow the practice of the Pennsylvania State Highway Department and design highway bridges for loads of 40,000 lb. The clear width of the roadway of a bridge should comply with the requirements pertaining to roadway width cited above. In addition, the vertical clearance should be given consideration and in this connection the over-all height of 12 ft. 2 in. for motor trucks heretofore mentioned, should receive attention. This is an important factor, not only in the design of through truss bridges, but likewise in providing for clearance underneath railway bridges.

Drainage and Foundations: American highway literature contains an enormous amount of advice pertaining to drainage and foundations. Although it is generally conceded that the importance of this subject has not been over-emphasized, nevertheless American practice is far from satisfactory. The writer believes that the increasing use of highways by motor transport will cause so many failures of in-sufficiently drained highways and others which have weak foundations that there will be a general improvement in the near future. As loads are transmitted from the wearing course to the foundation and from there distributed to the subgrade, the bearing power of the soil composing the subgrade is an important factor in the design of the highway. It is well known that the bearing power of soils in many instances is materially increased by efficient drainage. The roadway, therefore, should be so drained that the maximum bearing power of the subgrade is developed. While a poorly drained roadway might support a light rural traffic, it would be rapidly destroyed if subjected to commercial motor transport including, for example, several 5-ton trucks. Highway engineers should insist that sufficient time be allowed, in which to make adequate drainage surveys in order to determine the most efficient method of drainage to adopt in each case.

The greatest improvement noted in American foundation practice is the use of cement concrete foundations, or stone foundations of equivalent strength, on state trunk highway systems. The concrete foundation, as a structure, should be analyzed from the standpoint of the external forces acting upon it, the stresses resulting from such forces and the composition and depth of the concrete foundation to provide for the strains within it. Although data are meager upon which to design concrete foundations, nevertheless it is high time that a concrete foundation should be looked upon as a structure and designed, so far as possible, according to the methods now used in designing other structures. The design of the foundation is particularly complicated, due to lack of knowledge pertaining to the distribution of the load through the concrete, the pressure on the subgrade supporting the foundation, and the maner in which the concrete foundation acts as a structure. It is apparent, however, that a series of asumptions may be made upon which the design of the concrete foundation may be based, and that the results may be used as a guide to determine the composition and depth of the foundation. The above limitations pertaining to motor trucks allow a load per linear inch of width of tire of 800 lb. and a maximum gross load on four wheels of 28,0000 lb. Based on statistics furnished by many motor truck companies, the maximum concentrated load under one rear wheel may amount to 11,000 lb. This load, therefore, distributed over the area of contact of the tire may be considered the force for which the foundation should be designed, from the standpoint of direct compression. The foundation may likewise be considered as a beam or slab, two or four concentrated loads of the above amount being considered as beam reactions while the upward pressure of the earth against the base of the foundation may be considered as a distributed load. Depending upon the possible position of the loads assumed, the beam or slab may be considered as a continuous structure or with cantilever projections. Again, assuming that the subsoil under certain sections of the foundation is not in contact with the base of the foundation, a beam or slab action may take place, considering the external force to consist of a single concentrated load of 11,000 lbs. and the beam or slab to have both ends fixed or to have one end fixed and one end free. It is self-evident that several assumptions may be made relative to pressure on the subsoil, the condition of the subsoil beneath the concrete foundation, the distribution of the external forces, and impact forces.

Roadway Wearing Courses: For the type of roadway under consideration, namely, a short trunk highway connecting two municipalities, the roadway surface should be composed of bituminous concrete, cement-concrete, brick or stone block. Special local conditions, such as a hospital or schoolhouse located on the trunk highway, might render it advisable to construct a wood block pavement for a limited section due to the noiseless character of this type of roadway under traffic. The forces which should be given consideration in a selection of the surface are the direct load causing compression in the wearing surface, impact forces, and shearing forces of the driving wheels, the amount of which will be a function of the weight of the vehicle and the speed at which it travels.

Detours: The growth of motor transport will force highway engineers to give serious attention to providing serviceable roadways for traffic during highway improvement. In some cases roadways will be provided alongside the highway under improvement, in others one-half of the highway will be improved at a time and in others the traffic will be shunted around detours. Highway transportation interests will soon emphatically demand that the same consideration be given to the facilitation of highway transport as is usually provided for railway transport when a railroad line is under reconstruction.

Itinerary of Army's Transcontinental Truck Convoy

The itinerary of the transcontinental army motor truck convoy which left Washington, on July 7, for the Pacific Coast has recently been announced by Brig. Gen. C. B. Drake, Chief of the Motor Transport Corps of the U. S. Army. The itinerary in detail follows:

Control point.	Approximate mileage from previous control point.	Scheduled to arrive on or before.	
Washington, D. C.	Starting Point	July	7
Frederick, Md.	46	"	8
Chambersbur, Pa. (via Gettysburg, Pa.)	62	"	9
Bedford, Pa.	57	"	10
Greensburg, Pa.	63	"	11
East Palestine, O.	81	"	12
Wooster, O.	88	"	14
Bucyrus, O.	63	"	15
Delphos, O. (Detour on new road)	70	"	16
Fort Wayne, Ind.	51	"	17
South Bend, Ind.	76	"	18
Chicago Heights, Ill.	78	"	19
De Kalb, Ill.	80	"	21
Clinton, Ia.	84	"	22
Cedar Rapids, Ia.	87	"	23
Marshalltown, Ia.	75	"	24
Jefferson, Ia.	81	"	25
Dennison, Ia.	68	"	26
Council Bluffs, Ia.	72	"	28
Omaha, Neb.	5	"	29
Columbus, Neb.	88	"	30
Grand Island, Neb.	64	"	31
Lexington, Neb.	82	Aug.	1
North Platte, Neb.	64	"	2
Big Springs, Neb.	75	"	4
Kimball, Neb.	86	"	5
Cheyenne, Wyo.	66	"	6
Laramie, Wyo.	57	"	7
Medicine Bow, Wyo.	59	"	8
Rawlins, Wyo.	62	"	9
Tipton Station, Wyo.	58	"	11
Green River, Wyo.	60	"	12
Fort Bridger, Wyo.	63	"	13
Evenston, Wyo.	35	"	14
Ogden-Salt Lake City, Utah.	88	"	15
Orr's Ranch, Utah.	74	"	16
Sheriden's Ranch, Ibapah (Detour on new road saving 25 mi.), Nev.	80	"	18
Ely, Nev.	84	"	19
Eureka, Nev.	83	"	20
Austin, Nev.	70	"	21
Westgate, Nev.	70	"	22
Fallon, Nev.	54	"	23
Carson, Nev. (Detour on new road)	66	"	25
Myers, Cal.	34	"	26
Placerville, Cal.	50	"	27
Sacramento, Cal.	52	"	28
Stockton, Cal.	48	"	29
Oakland, Cal.	80	"	30
San Francisco, Cal.	Terminus	Sept.	1

General Drake has invited regional and state chairmen and other members of the organization of the Highways Transport Committee of the Council of National Defense to meet the convoy as it passes through their localities and take advantage of the opportunity to learn what is being accomplished by the trip.

Cost and Service of New York State Highways

A Discussion of the Actual Costs of the Improved State Highways in New York and of the Service Rendered

By **GEORGE C. DIEHL,**

County Engineer of Erie County, New York

Essential elements in the costs of highway transportation are the cost of road construction and maintenance, and the cost of vehicle construction, maintenance and operation.

The first two costs are primarily the concern of the highway engineer. In these days of million and billion dollar expenditures there is a tendency to expend fabulous sums for permanent highways, so-called.

Of course, every highway engineer is well aware that no road surface is permanent and the time is sure to come when a new surface must be constructed.

The actual annual cost of a highway includes the yearly interest and sinking fund charges, the yearly cost of maintenance and the yearly allowance to provide a resurfacing fund.

Interest and sinking fund requirements cease when the bonds mature, but this is often from 30 to 50 years, and for that period, at least, should be included; and at maturity it is difficult to foretell road requirements and problems.

Large sums of money have been squandered in the construction of too expensive highways, as well as in the failure to provide sufficient funds.

Sooner or later every wasted dollar must be made good—generally by the consumer who staggers under high living costs and is apprehensive lest there be no check in rapidly mounting prices. The only sure remedy is to practice economy, particularly in the disbursement of public appropriations, knowing that every dollar saved helps lift the burden. Accurate statistics comparing tonnage, construction, maintenance and financing costs would help to determine sound highway policies and proper types of construction, including widths, cross-sections and materials.

Unfortunately such statistics have not been gathered, but a systematic record of costs and travel should be outlined and comparative figures collected which would be of great value in a year or two and absolutely indispensable after a term of years.

New York State has expended more money than any other commonwealth in highway construction and has the greatest mileage of connected improved roads, so that her experience is of value in considering the highway problem.

There cannot be much doubt that an expenditure of $50,000 to $60,000 a mile is required and would be justified on the main highway from Buffalo to New York, and possibly on a few other important trunk lines. It is equally certain that expenditures of upwards of $30,000 per mile would be grossly extravagant on a great part of the state and county highway system, and that $15,000 per mile would be far too much to spend on the preponderating majority of lateral roads.

A prominent highway official recently stated that every mile of road in the state should be of a type costing at least $30,000 per mile. There are 80,000 mi., and this plan would require $2,400,000,000—so impossible that discussion is unnecessary.

Starting in 1898 with an appropriation of but $50,000, which was supplemented by an equal amount by the localities, the state engineer improved about 12 mi. of highways with water-bound macadam at an average cost of $8,000 per mile. This type of pavement was specified almost exclusively until 1909, and 2,000 mi. were constructed during this period at an average cost of about $9,000 per mile.

In 1909, the State Highway Commission was created and about the same time motor vehicle traffic began to increase very rapidly, and other types, such as the asphalt macadam, both penetration and mixing method, and brick block became quite common. In 1915, about 61% and in 1916, about 46% of the state projects provided for the water-bound macadam type of pavement, and a total of about 3,560 mi. of this class of pavement was constructed.

Many of the older water-bound macadam pavements which had been constructed on the main routes have been resurfaced, and in some instances reconstructed with more substantial pavements. By reference to the State Highway Bulletin just published it can be noted that about 1,040 mi. of these pavements have been resurfaced, about 205 with the same type, 810 mi. with asphalt macadam, penetration method, and 25 mi. with asphalt macadam, mixing method; and about 125 mi. have been reconstructed, 67 mi. with new concrete pavement and 58 mi. with new brick pavement, leaving about 2,600 mi. of water-bound pavement still in the state system.

New York State, in building water-bound macadam pavements continuously for 20 years, to the extent of 3,560 mi., has found it necessary to reconstruct with a pavement of a radically different type 3½% of the total, and resurface with a new top course of macadam, using the old pavement as a foundation, about 30%.

During the first ten years of state highway improvement, 1899 to 1908, no maintenance was provided by the state, but the law provided that the maintenance should be performed by the towns. In 1909, state maintenance work and supervision were instituted. The water-bound macadam pavements have accordingly been separated into two groups. Of the 2,000 mi. of water-bound macadam constructed from 1899 to 1908, and upon which maintenance had been neglected, about 860 mi., or 42%, have been resurfaced and reconstructed. Of the 1,560 mi. constructed between 1908 and 1918, about 180 mi., or 12%, have been resurfaced or reconstructed.

With modern conditions of traffic where motor vehicles predominate, water-bound macadam can only be maintained by surface treatment of asphalt or tar. With the light cold materials and heavy traffic, the surface treatments are required every year, while with average traffic the treatment may be omitted about every third year.

When the surface treatment is delayed beyond the proper time surface holes develop rapidly and constant patching is required.

In 1909, the state first undertook the construction of the asphalt macadam, penetration method, and this pavement soon became the prevailing type for the main through and market routes.

The state system now includes about 3,000 mi. of this type, of which about 850 mi. are old water-bound macadam gravel and second-class concrete pavements which have been resurfaced with a new asphalt macadam top course, laid over the old pavement as a foundation.

It is significant to note in the bulletin that of the 3,000 mi. that have been so constructed it has been found necessary to reconstruct but about 10 mi., or ⅓ of 1%, with a pavement of different type. About 8 mi. have been reconstructed with concrete pavement and about 2 mi. with brick pavement. One hundred and ten miles, or about 3⅔%, have been resurfaced with a new top course of the same type. Many of these pavements have been subjected to nine years of traffic and are in perfect condition today, resembling sheet asphalt.

Little maintenance is required for asphalt macadam pavements for the first three or four years after construction. About four years after improvement the pavements are given a surface treatment of light asphaltic oil which acts as a flux to the asphalt in the macadam which works to the surface and is distributed by traffic, to the extent that the seal coat is renewed and under ordinary conditions another treatment will not be required for at least five years after the first treatment.

Little or no trouble is experienced by pitting or raveling, and the pavement will stand considerable neglect without serious deterioration. The cost of maintenance for the first three years of ten asphalt macadam pavements, selected at random, aggregating 54 mi., is found to be $180 per mile per year.

During the period from 1912 to 1914 there were constructed about 300 mi. of second-class concrete and Hassam concrete with a light bituminous surface, generally of tar.

These types have not given satisfaction, as the concrete does not sustain traffic without disintegration unless protected by a bituminous mat. This light veneer surface of bituminous material is with difficulty maintained, and constant patching of the surface is required. These pavements have been covered with a course of asphalt macadam as fast as funds would permit and about 40 mi., or 13%, of the total have been so treated, about 24 mi. having been surfaced with the penetration type and 16 mi. with the mixed method of asphalt macadam. These types were discarded in 1914 when the first concrete pavements of the present-day type were constructed.

There are now 360 mi. of standard concrete pavements in the state highway system, all constructed within the past five years.

Commencing in 1909, and continuing to date, the State Highway Department has constructed a limited amount of brick pavement each year. There are now 350 mi. of this pavement in the state system.

The state system contains about 122 mi. of asphalt macadam (mixing method) pavements of various specifications, laid both on macadam and concrete base, which have been constructed over a period of ten years. Less than ½ mi. has been reconstructed or given a general resurfacing.

In order to determine the relative cost of maintaining the various types of pavement, the State Highway Commission, in the year 1915, decided to segregate the expenditures for maintenance and repair, charging to the various types of pavements all exepnditures obligated to the roads of such types, and in the annual report for the year 1917 is found a tabulated statement of the average cost per mile, combined for the years 1915-1916 and 1917, for the types having a material mileage in the state system.

This table should be qualified by a statement giving the average age of the pavements, as the relative cost of maintenance bears some considerable relation to the average age of the pavements maintained.

The ages of the pavements in the New York system in 1917 ranged about as follows: Water-bound macadam, 1 to 18 years; asphalt macadam, penetration method, 1 to 8 years; concrete pavement, 1 to 4 years; brick pavement, 1 to 8 years.

The maintenance cost data published by the New York Commission does not include resurfacing costs of brick and concrete pavements—as such work—as these pavements are not yet old enough to require resurfacing.

As the old macadam type of pavements shown in the table carries the resulting resurfacing charge, it will be necessary to eliminate this expense or to add an estimated charge for resurfacing of the concrete and brick pavements, and the first mentioned method would appear more consistent.

By reference to the annual reports and the latest bulletins, it is determined that during the years 1915-1916-1917, some 635 mi. of resurfacing was performed and that the average cost of the new top course, generally of asphalt macadam, was $6,260 per mile.

Five hundred and five miles, or 21%, of the water-bound macadam was resurfaced, representing an average charge of $437 per mile per year when distributed over the average number of miles of this type maintained; 57 mi., or 2%, of the asphalt macadam, penetration method, was resurfaced in this period of three years, the cost of which, distributed over the entire mileage of the type, represents an annual charge of $45 per mile. The records of the bulletin indicate that of the 80 mi. of this type constructed in 1909, only 7.2 mi., or 9%, have been resurfaced in a period of nine years, or 1% per year.

Thirty miles of gravel and 43 mi. of second-class concrete were also given a new asphalt macadam top course during this period, but as the types are obsolete they will not be considered in the table of comparative costs.

In the accompanying table an effort is made to illustrate the economic features pertaining to the selection of a pavement suited to the average highway having average traffic conditions. The cost of improvement is based on estimates prepared and proposals received by the New York State Commission and the fixed charge of interest is computed at 4% (sinking fund charges being omitted).

Type.	Average cost of improvement.	Interest on first cost at 4%.	Average cost of maintenance.	Total cost per mile per year, exclusive of renewal.
Asphalt macadam penetration method)	$22,000	$880	$419	$1,299
Water-bound macadam	20,000	800	539	1,339
Concrete	35,000	1,400	124	1,524
Brick	50,000	2,000	196	2,196

The cost of upkeep and maintenance is taken from the published data in the report of the New York Commission for the year 1917, which has been amended by subtracting the cost of resurfacing of the macadam types as enumerated above in order that a consistent comparison may be made of maintenance costs only.

Complete data are not available with which costs of ultimate renewals by resurfacing can be determined.

While the periods between resurfacing of the more costly types are of longer duration than are those of the macadam types, the cost of such resurfacing is necessarily more expensive.

This table appears to demonstrate conclusively that the majority of the mileage should be constructed of the two macadam types.

The New York statistics are not sufficiently complete to determine what is the character and amount of traffic which will require the more expensive types.

Complete statistics should be collected; a traffic census should be taken frequently, and interest, sinking fund, resurfacing, renewal and maintenance cost per ton-mile ascertained, also the annual tonnage per foot width of road metal.

The demand for wider roads and more rigid control of traffic is even more pressing than of more durable types.

Until more detailed reports and statistics are available, it will not be possible to estimate accurately probable traffic

(Continued on page 57)

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
Editor

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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HIGHWAY TRANSPORTATION

Transportation of freight and passengers over the highways of the country on a commercial scale has become an accomplished fact during the past few years. When the Great War broke out in Europe, the use of the motor truck was in its infancy in this country. Though it was utilized —and utilized extensively—it was found chiefly on the streets of cities and towns, in short-haul intercity service and in hauling over routes radiating from market centers and shipping points to farms, mills, mines and lumber jobs in the adjacent country. It had not become a serious competitor of the railroad for short-haul business, nor were its possibilities for work over long distances foreseen.

With the over-load imposed upon the railroads by the exigencies of war, other transportation means had to be developed and in the emergency shippers turned to the motor truck. When the test came, that carrier was not found wanting. Instead, it demonstrated its adaptability to a multitude of diversified traffic needs. Today the truck takes care of a very large and ever-increasing percentage of the short-haul freight business, competing with the railroads in many cases, but acting as a feeder at the same time.

In this issue of "Good Roads," which is devoted almost entirely to highway transportation, various phases of the subjects are presented from a number of different viewpoints, largely by men who have been in the forefront of the development of highway transportation and also prominent in the correlated field of highway improvement.

In War. The part played by motor trucks in the Great War has as yet been only suggested. Not until the complete history of the conflict has been written—and perhaps not then—will the value of the motor truck be correctly measured, even by those most closely in touch with the development of motor transport in war. Though its most spectacular performances were in the theater of operations, the services rendered by the thousands of trucks in the auxiliary activities of war far from the front were little less remarkable and no less vital to the final triumph of the Allies. In this country, for example, the truck carried foodstuffs and munitions from the interior to the seaboard, brought lumber out of the forests, transported ore and coal from the mines; in short, met the transportation demands of the hundreds of activities incident to carrying on the war. Much of this was done by trucks operated by the War Department; more of it was done by private enterprise. The story of the latter will never be told except in occasional sketches. A brief, yet comprehensive outline of the former is given elsewhere in this issue by an officer of the Motor Transport Corps of the Army.

M. T. C. Truck Train. In order to further develop the use of motor trucks, especially in long-distance hauling, the Motor Transport Corps has recently started a convoy of motor trucks on a transcontinental trip. The train left Washington on July 7 and is expected to reach San Francisco on Sept. 1, following as closely as possible the route of the Lincoln Highway. The tour has several objects. It is expected to yield very valuable data on the performance of motor trucks in such service; to give valuable training to officers and men; to stimulate recruiting for the Motor Transport Corps, and to demonstrate the military and economic necessity of good roads.

Highways Transport Committees. Early in the war, it was realized that motor truck transportation would play an important part in the country's war work, and steps were taken to promote the use of trucks and to facilitate in every possible way their effective operation. To this end the Highways Transport Committee was created as an auxiliary of the Council of National Defense. This committee served throughout the war, and has been continued to aid in the development of motor truck transportation in the country's peace-time activities.

The story of the war work of the committee is told in this issue by R. D. Chapin, who served as its chairman from its establishment until the end of the war. John S. Cravens, who is now chairman, outlines the committee's present organization and functions and its plan for future work.

Postal Service. Extensive use of motor trucks has been made by the Post Office Department in the parcel post. By carrying an amount of first-class mail that occupies an insignificant amount of space, and through its monopoly of such service, the Department is enabled to carry bulky freight or express matter over comparatively long distances at low rates, and still make a profit. Many routes have already been established and further extension of the service is planned.

Passenger Carrying. Although the carrying of passengers is of less commercial importance than the hauling of freight, that particular branch of highway transportation is by no means negligible. Many sections without railroad facilities that were formerly inaccessible have been opened up by the motor-driven vehicle, and many others with poor railroad facilities are now well served by motor passenger lines operated on regular schedules. In many instances the motor cars make better time than the railroads and give better service at lower rates. In some cases this competition has made appreciable inroads upon the revenues of the rail lines.

Trucks in Road Work. Of special interest to road builders is the employment of the motor truck in the construction and maintenance of roads and streets. This use is not by any means new, but it has received great impetus during the past few years and promises even more notable advances in the near future. Because of the shortage of labor, road builders are turning more and more to labor saving machinery, not the least effective of which is the motor truck. As is noted on other pages, it is employed in a variety of ways. Naturally, the principal one is for the transportation of materials, equipment and men, but it is also extensively used in many different special services.

Trailers. While the motor truck alone is an efficient and economical transportation unit, there often exist conditions under which its efficiency can be increased and the cost of operation materially lowered by employing it in connection with trailers. This method of highway transportation has not been employed to the same extent that others have, nor has it been so commonly utilized here as abroad. But it is rapidly growing in favor and bids fair to assume proportions of considerable magnitude within a short time. An article by the general manager of the Trailer Manufacturers Association presents the case of the trailer at some length and in considerable detail.

What It Means to the Road Builder. The development of motor transportation is a matter of the most vital import to the road builder. It means that the road must be built for the load; that every effort must be made to meet the demands of industry and commerce for better and cheaper transportation. Shippers are awake to the possibilities of this means of marketing their goods, and the public is beginning to appreciate the economic value of the country's highways. In response to this awakened interest, enormous sums have been designated for road improvement and the probabilities are that still larger appropriations will be made within the next few years. Everything indicates the beginning of an era of road building that will surpass anything of the kind that has yet been seen and bring with it unparalleled opportunities for those who build the country's roads.

Record Bond Issue in a Texas County

Dallas County Votes $6,500,000 for Improvement of Highways

The largest bond issue ever submitted to the voters of a Texas county and one of the largest county issues ever voted in the country has been ratified by a big majority in Dallas County, Texas.

The vote authorizes the issuing of $6,500,000 of bonds, the proceeds of which will be used for the construction of a belt line around the county, twelve roads radiating from Dallas and six intermediate roads connecting the radials. The system to be built includes 332 mi. of road, and it is expected that an additional 100 mi. of feeder roads will be improved with the money saved by the lower maintenance cost on the improved roads. The county has been allotted about $250,000 of federal aid.

Lanes of Commerce

A Vast System of Highway Transportation in the Making

By WINDSOR T. WHITE
Chairman, Motor Truck Committee, National Automobile Chamber of Commerce

WINDSOR T. WHITE.

Every state in the Union, with the possible exception of three, has authorized, or is going to authorize, bond issues for the building of good roads. However, the mistake of building them of too light construction should be carefully avoided. They should not be built as roads were built twenty years ago, before the advent of the motor truck, when horse-drawn wagons were the sole users of the highways.

We are not building our highways to look at, nor are we building them for horses and wagons. We are building them for highway motor transportation; for great lines of motor trucks, which are going to use them for transporting our commerce, as feeders for the railroads—the long haulage units—and for bringing food in from the farms.

Twenty years ago we did not need highways as we do today, for the demand was for ordinary dirt, or, at the very best, lightly constructed macadam, because they were called upon to carry one or two horses and a light vehicle. Today, however, a hard surface adequate to bear the traffic is required, and the high cost of it is only economy in dollars when commerce instead of pleasure uses them.

Think what it is going to do for you personally in the way of lower costs once highway transportation gets its proper pace—it means that you are going to get more for your money. And I will tell you why.

Transportation in the past has been by our inland waterways and our railways. Each had its capacity for getting into certain places. But they have not been adequate to our growing demands—the demands of 100,000,000 people.

The big demand today is for food, and we are not getting enough of it, and so of course we are paying a heavy penalty because the railways and waterways do not reach the farms.

Now, with the coming of the rural motor express, we are going to reach out into every hill and valley and provide the farmer with quick and efficient economical transportation by motor truck, so that he will be encouraged to raise larger crops and send them to you. This will mean that you will get more food for less money; the farmer will get a greater return because of the larger consumption, and your city and state will benefit generally.

The coming of hard-topped highways and motor transportation will usher in a new era of advancement, will open up new sources of production and throw our lines of commercial influence around the world.

◆

The Roosevelt Highway in Chicago, Ill., came into existence on July 2, when 12th street from the Desplaines River to the Lake front was christened Roosevelt Road, with elaborate ceremony. Addresses were made by President John E. Wilder, of the Roosevelt Memorial Association, and others, and the speeches were followed by a parade of several hundred automobiles.

Transcontinental Army Truck Trip an Assured Success

President of the Kissel Motor Car Company Believes Army Motor Truck Train Blazes Trail for the Future

The army motor truck train that is now on its way across the continent will develop hitherto unheard of and undreamed of potentialities of the motor truck, according to G. A. Kissel, President of the Kissel Motor Car Co.

The ability of the motor truck to make long trips on definite schedules was proven so often during the Great War, according to Mr. Kissel, that he has often wondered why American manufacturers and industrial leaders did not take advantage of it in this country. Continuing, he said, in part, in a recent statement:

"True, there have been very successful runs of motor trucks extending 300, 400 and 500 mi., and the trucks and their loads were none the worse for the trip. In fact, both arrived in as good condition as when they started. I understand that on these particular trips, the consumption of oil and gasoline, the wear and tear on tires, mechanism, etc., was very satisfactory.

"So I look for great results from this cross country trip, foremost among them being, of course, the adaptability of the motor truck for long distance transportation, which, as I have said before, I believe to be a foregone success. The motor truck of today is built for long and hard service. In most cases the manufacturers and designers are hard-headed business men with practical experience in the hardships and obstacles motor trucks must overcome to do the work required of them.

"The second result will be a close-up view of the road conditions of America. Two hundred odd men who will accompany this fleet of trucks will have brought forcibly to their minds the necessity of America's taking off its coat and rolling up its sleeves to build more roads and improve present ones. If this coast-to-coast truck train falls behind schedule, it will be because the condition of some of the roads was not taken into consideration, or that we have not a clear idea of how few good roads we have when the country's total road mileage is taken into consideration. * * *

"This first transcontinental motor truck trip will convince farmers as no other means could, of the adaptability of the motor truck for long-distance hauling, and there is not a larger class of prospective customers in the country who could cash-in on this adaptability of motor trucks as the farmers, who are the backbone of the country. There are thousands of farmers who do not yet believe that the motor truck is competent to transport their produce over long distances—that these farmers, even though their farms are many hundreds of miles from the nearest center can likewise take advantage of the use of the motor truck for long distance transportation which this transcontinental trip will prove. Once agricultural America as a whole employs motor trucks to transport its produce to market, the cheaper the produce can be sold at the market, because more can be delivered in less time and at less cost. Remember, the cost of producing wheat, corn, rye—all the fruits and vegetables—is the biggest part of production cost. Once this cost is reduced, its selling cost can be likewise reduced. * * *

"Another object of this Motor Transport Corps transcontinental trip is to enlist young men to serve in the corps, these young men to be sent to schools in September. Consider what this education means to the future of motor truck transportation in the United States. When it is considered that the economy and efficiency of motor truck transportation do not rest entirely on the motor truck, but equally so on knowing how to properly drive, handle and take care of the truck, it can be seen what a big asset to the country these young men will be after they have been thoroughly schooled and graduated into first-class motor truck operators and dispatchers. Without a doubt, one of the results of this transcontinental trip will be that in every city the train passes through or stops, hundreds of young men who want to get ahead, will quickly seize the opportunities which the Motor Transport Corps offers them.

"It has been proven that motor trucks operated by competent drivers, men who not only know how to properly handle and drive a truck, but who also have the knowledge to enable them to anticipate any trouble and recognize same before developed, or to make adjustments or repairs on the road, are the trucks that have lowered upkeep, maintenance, tires, gasoline and oil consumption records.

"Consider, then, the immense saving to owners as well as to the country—the increased service the motor truck will render owners when in the hands of young men who have been through Uncle Sam's motor truck transport schools and have become graduated A-1 motor truck experts.

"Another lesson this first cross-country trip will teach us is the condition of America's highways as a help to motor trucks in rushing troops, supplies and equipment from one city to another or from one state to another in times of internal trouble. While I hope such an emergency may never arise, it is one that we should provide against and be on guard to nip in the bud, and we can only do this if our highways are developed enough to get all the speed, dependability and performance that are built into trucks. Such highways will also enable the city police, fire and water departments to extend their areas of operation, which, in itself, is a big asset to the community."

Cost and Service of New York State Highways

(Continued from page 54)

increase or to select in doubtful cases the most economical types of highway construction.

It is certain that the most heavily traveled highways should be wider, and that increase of width will add greatly to the life of all types of pavement.

At present 10% of the New York State improved highways are of brick or concrete construction—90% of bituminous and macadam types.

A careful study of New York State statistics and highways would indicate that there should be in the state aid system a gradual increase in the percentage of brick and concrete, with a corresponding decrease in percentage, but not in mileage of other types, but it is unlikely that for many years the proportion of the more expensive types should exceed 20%, and at least 80%, or four-fifths, of the mileage will be of the various bituminous macadam types. New York and practically every other state needs largely augmented highway funds; many added millions must be expended.

Systems cannot be completed and properly connected unless rigid economy is practiced, and the highway per ton-mile cost reduced to the minimum. No single factor is of greater moment than correctly selecting the type of construction.

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Floyd County, Texas, will vote on a $500,000 bond issue at an election on Aug. 9.

New Hampshire Good Roads Association

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The city forces of Nashua, under the direction of Superintendent William Tolles, have repaired a section of Main St. with granite block and cement grout. They are also rebuilding the section of Milford St., and the state highway from Nashua to Milford has been rebuilt with bituminous materials under the direction of Mr. Tolles.

Geo. P. Winn, former City Engineer of Nashua, and also Engineer of Housing Construction for the U. S. Government at Bath, Me., paid a short visit to Nashua and told his friends that he expected to be released from Government service about the middle of August.

The final hearing in the investigation of county affairs by a committee of the county delegation, of which Representative W. J. Callahan is chairman, has been completed, and the committee, consisting of Representatives Frank Robb, of Marlow, Merrill Symonds, of Jaffrey, Willard Pierce, of Dublin, and Edward F. Qualters, of Winchester, has announced that a report upon their findings will be made within a short time. During the investigation many witnesses were called and examined.

The Suncook Bridge, which spans the Suncook River between Concord and Manchester, has been reported as being in a dangerous condition and the Concord Board of Public works has voted to hold a hearing on the matter. Several accidents to motorists have happened lately and for this reason the subject has been brought to the attention of the authorities.

The federal employment agent for New Hampshire has given notice that all Government employment offices in the state would be discontinued except the one in Manchester. Lack of funds was given as the reason.

The Mayor of Manchester has contracted for the installation of ornamental electric lighting fixtures for the "white way" on Elm St.

Contracts have been awarded by the State Highway Commission for the construction of the following bridges:

Over the Piscataquis River in the town of Howland, to the Cyr Bros. Co., of Waterville, for $48,975; over Macwahoc stream in the town of Macwahoc, to the selectmen of the town for $8,200; the Duck Trap Bridge in Lincolnville, to the Cyr Bros. Co. for $18,840; Dover South Mills Bridge, to the selectmen of Dover for $4,500; Cathance Bridge in Topsham, to Edmond Cyr & Co., of Waterville, for $9,510.

Manchester has lost the cup this year for the cleanest city in New England. The award was made at a meeting held at Young's Hotel, Boston, when the city of Malden was awarded the cup for the second time, having been previously honored in 1916. The cup becomes the property of the city or town winning it three times. Manchester was awarded honorable mention.

The judges were Governor Spaulding of New Hampshire, Governor Coolidge of Massachusetts, and Frank Whitchen, President of the Massachsetts Chamber of Commerce.

The State Highway Department has received from the Federal Government 24 trucks—15 Nash "Quads," 4 heavy aviation, 3 Peerless and 2 Seldens, and approximately 60 more have been assigned to the department.

Bids were opened by the State Highway Commissioner for Section A of the Lafayette Road, July 21, and contracts have been advertised for work in Hinsdale and Winchester, Fremont and Milford bids to be opened July 25.

John J. Golden, for the past two years superintendent of the Street Cleaning and Sanitary Department of the City of Nashua, has resigned and will return to his former position as assistant to Mr. Hugh G. Kennedy, Street Commissioner of Medford, Mass.

This is one of the changes due to the political uprisings which have taken place recently between the Mayor and the Board of Public Works.

The City of Concord, N. H., has relaid Main St., from Freight St. to Thorndike. This work consisted of 6-in. macadam, tar penetration method. This street like all other bituminous bound streets was carried on by the so-called Hand Ford method.

The barrels of binder are raised by hand and placed over a heating kettle and the binder is drawn off into hand pouring pots and applied on the road in this manner.

Mr. Clark tried a new plan of having the binder hauled over the road from Boston by motor truck, but feels that the hand method is very satisfactory.

The large truck carrying 1,200 gal. of tar binder from Boston to Concord recently met with a very bad accident. Just before reaching Manchester on the trunk line at the end of the steep grade was a very sharp turn. Coming in the opposite direction was a touring car that did not gauge the distance properly, causing the driver of the tar truck to swing to his right. The truck tipped over, breaking two wheels, and the driver and helper were slightly injured.

Concord has a new stone crusher and Superintendent Clark is very much pleased with it.

Laborers in Concord are receiving $3.45 per day and have petitioned the Mayor and Board of Aldermen for a 20% increase. A hearing will be held at an early date to decide the matter.

Concord is going to relay Warren St., from the railroad bridge to St. Paul St., with 6-in. bituminous bound macadam.

Laborers on the state highway receive $3.50 and $4.00 per day.

Commissioner Everett says that there is no shortage of labor this year.

The many friends of Lieut. Syre, formerly with the A. E. F. in France, will be pleased to know that he is back on the job again. Lieut. Syre went to Camp Devens in April, 1918, remained there for 10 days and then he left for overseas. After a month of training he was immediately forwarded to the front line trenches. In July he was successful in passing examinations for the Officers' Training School and after 90 days was transferred to the Ammunition Train Detachment and remained there until hostilities ceased.

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Crusher Run

The New York State Highway Department has advertised for bids to be received on August 5, for the improvement and completion of about twelve roads.

State Highway Commissioner Greene, has abolished the position of chief of maintenance, which has been held for the past five years by Joseph Curran, of Richmond County, at a salary of $4,000 a year.

Albany will be the north terminal of the great new Henry Hudson Drive, a modern highway being constructed from New York City following the line of the river, on which work has just been resumed with returned soldiers forming a large share of the labor. So far the road has cost $500,000.

The Greenbush Bridge, which was a toll bridge until made free by the Malone Act, will in future be known as the "Hudson Bridge." This name was suggested by Governor Smith, and in making the suggestion the Governor said that he did not know of a bridge along the river by that name, and he considered it very appropriate.

State Highway Commissioner Greene has advertised for bids for the Bradford-Carrolton Highway, which will be a federal aid road, and for which the residents of Bradford, Pa., donated $90,000. This is the first instance in the history of state road construction where the residents of a town of another state contributed to the cost of constructing a highway in New York State.

High Estimates for July: Road No. 1,312, S. B. Van Wagenen, $22,920.71; Road No. 1,190, S. B. Van Wagenen, $13,512.72; Road No. 1,348, Jos. Walker Construction Co., $12,023.56. Also estimates were received for the American Pipe & Construction Co., Chenango Construction Co., Louis Mayersohn, Nathan E. Young, DeGraff & Hogeboom, Inc., Paddleford & King and J. P. Dugan & Co., Inc.

A meeting was held at Saranac Lake, to determine the route to be followed in Franklin County in building the road connecting Utica with Old Forge, Raquette Lake, Long Lake and Saranac Lake, which was ordered built by the Legislature of 1918. Commissioner Greene addressed the meeting, it being the first time that the highway commissioner was empowered to construct a highway through the forest reserve.

The month of July, 1919, records three large lettings which took place at the New York State Highway Department. One occurred on the 22nd in which there were 28 roads let. One of the largest lettings of the season will take place on the 29th, when bids will be received for a total of 123 mi. of highways. All except two of the 23 contracts are for the completion of roads abandoned during the war. Eight of the highways are to be of concrete, following the policy of Commissioner Greene to build as many roads as possible of that material.

State Highway Commissioner Greene has been requested by the residents of Nassau County to have the highways of the state covered with a dark dressing, giving as their reason, that the light dressing on the roads is injurious to the eyes. The suggestion was made that lamp black be mixed with the concrete, thus producing a dark top dressing which they thought would be preferable to the light one. Commissioner Greene informed them that the change was not likely to take place because of the fact that drivers found it much easier to find the road at night when the surface is white.

The following awards were made at the recent New York State highway letting held on July 1:

Improvement Contracts: Albany County, No. 5,636, Browne Lowe & Parker, $114,751.00; Herkimer County, No. 1,362, Frank V. Brotsch Co., $213,423.00; Herkimer County, No. 1,363, Frank V. Brotsch Co., $193,112.00; Putnam County, No. 1,512, Samuel Beskin, $83,175.25; Saratoga County, No. 1,523, Harridine Bros., Inc., $38,682.50; Erie County, No. 924B, Felton Construction Corp., $81,484.75; Hamilton County, No. 1,258, Rosoff Engineering Co., $91,668.68; Niagara County, No. 1,315, F. J. Mumm Contracting Co., $129,755.40; Schenectady County, No. 5,545, J. J. Malloy, $66,450.40; Wayne County, No. 5,632, Hendrickson-McCabe Construction Co., $8,517.76.

Repair Contracts: Rensselaer County, No. 1,208, Troy Contracting Company, Inc., $88,808.90; Ulster County, No. 1,224, John F. Gallagher, $54,295.00.

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The Illinois Division of Highways has recently awarded several large contracts for the construction of main roads of the state. A contract for the completion of the Chicago-Joliet Highway was awarded to the I. F. Conway Co., of Chicago, Ill., at $364,000. A contract for the construction of several sections of the Dixie Highway in Iroquois County between Chicago and Danville was awarded to the Warner Construction Co., of Chicago, at $151,435. A contract for a section of road on the Peoria Highway was awarded to the Home Page Co., of Rockford, Ill., at $118,300. Two contracts on the road between Terre Haute and East St. Louis were awarded to C. J. Moritz, of Beloit, Wis., at $280,000, and to the James Black Masonry Co., of Chicago, at $217,000. The latter company also secured a contract for the construction of a road between Springfield and Carlinville at $900,000.

Massachusetts Highway Association

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Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston.

News and Gossip

The Boston Park and Recreation Department has recently been reorganized. The present board consists of Chairman James M. Shea, Charles A. Coolidge and James E. McConnell.

The full bench of the Supreme Court has dismissed petitions of Joseph Weeler, of Dover, and James Kimball, of Lexington, for writs of mandamas to compel the Commissioner of Public Works and the Chairman of the Board of Health of Boston to grant them permits to convey through the streets of Boston to their farms garbage collected from hotels and restaurants.

In 1912, the City Council of Boston made a contract with the Boston Developing & Sanitary Co. to collect all house offal, and in 1914 extended that contract so as to include hotels and restaurants. After that time no further permits were granted to farmers, who previously had taken all garbage from hotels.

The petitioners contended that an ordinance of the City Council and a regulation of the Board of Health were unreasonable, but the court finds to the contrary and says that the regulation of the Board of Health is within the police powers conferred upon it.

Chief Justice Rugg, in the opinion, says: "There is nothing in the record which requires the inference that there is any bad faith in any of the conduct of the city officers. The natural import is an honest effort to conserve the public health and promote the general welfare."

The court says that the precise question never has been presented before in this commonwealth, but it has been decided, however, in other jurisdictions.

Mayor Charles H. Adams, of Melrose, has started a movement to save shade trees along the city's highways and has prepared a note to be sent to the aldermen at their next meeting, in which he opposes the removal of the big tree in front of the Melrose High School. He calls attention to the age of the tree, which is about four times that of the city, and says all the city trees should be protected. "This tree cannot be removed without much expense and the destruction of the Main Street pavement as well as the sidewalk," the Mayor states. "If we enter on a policy of removing every tree that encroaches upon the highway we may go through every street and spend thousands of dollars and destroy scores of fine trees. I earnestly hope this great elm will be allowed to stand."

The Committee on Legal Affairs, to which had been referred several bills for the regulation of billboard advertising to carry out the constitutional amendment adopted by the people at the last state election, reports a resolve for an investigation by a commission to report to the next General Court. The commission is to consist of the attorney general, the head of the State Highway Commission, the chief of the district police, or their successors. The Supreme Court has rendered an opinion that some of the pending bills are unconstitutional.

The Massachusetts House of Representatives at a recent session passed to be engrossed, by a standing vote of 71 to 59, the bill for an improved highway in North Brookfield on the road to New Braintree.

Mr. Underhill, of Somerville, opposed the measure saying that it revived "the old system of log rolling for the passage of various highways in different parts of the state." Mr. Young, of Weston, was also heard in opposition.

Mr. White of North Brookfield said that the state would be called upon to pay only 50% of the cost, the town paying 25% and the county 25%. Mr. Emery, of Newburyport, Mr. Tower, of Dalton, Mr. Nelson, of Worcester, and Mr. Newhall, of Stoneham, favored the bill. Mr. Kneeland, of Winchester, said there were many miles of highway that needed attention more.

Mr. Briggs, of Plymouth, argued for an appropriation for an improved highway in Plymouth and Bourne. Mr. Young. of Weston, for the Ways and Means Committee, said the proposed improvement would practically parallel the existing state highway from Plymouth to Sagamore. The bill was rejected by a voice vote.

Mayor Peters, of Boston, recently called a conference of some fifty prominent contractors employed on city work and warned them that they must pay their men the prevailing rate of union wages and that failure to do so would result in the loss of their contracts and action by the municipal law department.

In a letter to Governor Coolidge, members of the Civil Engineers' Association of Boston and vicinity, through their secretary, Herbert L. Patterson, protest against the enactment of the bill of President McKnight of the Senate to suspend all civil service laws until July 1, 1920, so that soldiers, sailors, and marines may be appointed to Government positions without examination.

The McKnight bill would suspend until July 1, 1920, in favor of honorably discharged soldiers and sailors, the requirements of civil service examination and qualification for places in the public service.

In their letter to the governor, the members of the Civil Engineers' Association, after defining democracy as a government in which all citizens shall have equal rights and none shall have special privileges, declare that the McKnight bill is "especially pernicious in that it not only violates the rights of all citizens who did not actually wear a uniform in the past war, but it violates the rights of soldiers and sailors themselves, because an exceedingly small percentage of them can hope to be benefited, and then only those who can get the required political influence to place them. The only democratic and fair way to all or to the service men themselves is the existing custom of civil service examination, which guarantees equal opportunity to all."

Some Massachusetts tax rates: Medford increase over last year $1.20, to $22.60; Woburn shows a reduction of 40 ct., to $20.80; Braintree an increase of 40 ct., to $21.60; Waltham $21.00, same as last year; Amesbury $20.40, a decrease of $6.20; and Westwood, $9.00, which is $1.60 less than 1918.

The authorities of Boston have finally decided to repave a considerable length of Tremont St. and some local poet has been inspired to record the event in the verse which is printed below:

To Tremont Street.

(At Last Being Repaired.)

Grand old Tremont Street of Boston,
Central vein of Boston's heart,
Thou shalt now at last be rescued
From neglect, so long thy part!
All too long they have ignored thee,
Planning streets to take thy place,
Grudging thee the least attention,
Marring thy so noble face!
Central thoroughfare of old Boston,
Thou shalt yet come to thine own;
All thy length shall yet be teeming
With great business, now unknown!

We are tempted to remark that while the surface of Tremont St. can be repaired and improved, we can think of nothing that can be done for the poem.

A tentative report has been issued by the Legislative Committee on Administration and Commissions, which discloses its plans for the consolidation of more than 100 state boards into 20 new departments.

These changes must be made by 1920 and the present bill will place in the hands of the Governor the distribution of a vast number of lucrative positions.

It is proposed that the Governor and Council shall take over the following offices, boards and commissions:

The armory, art, state ballot law, foreign trade and commerce, consolidation of laws and uniform legislation commissions; the board of appeal from decisions of the tax commissioner, the commissioner of state aid and pensions, the commissioners of shipwrecked goods and the trustees of the state library.

Some of the jobs which would be created and the salaries to be paid:

Superintendent of public buildings, salary to be fixed; commissioner of agriculture, $5,000; advisory board of six members, $10 per diem; commissioner of conservation, $6,000; state forester, $5,000; commissioner of fisheries and game, $4,000; commissioner of entymology, $4,000; commissioner of banking and insurance, $8,000; director of banks and loan agencies, $5,000; director of insurance, $5,000; director of the division of savings bank life insurance, salary to be fixed; commissioner of education, $8,000; advisory board of six members, two to be women, probably unpaid.

Division of education of aliens, director of division of public libraries, director of division of the blind, salary to be fixed.

Commissioner of civil service, $6,000; two associate commissioners, $25 a day; deputy commissioner, salary to be fixed; commissioner of labor and industries, $8,000; assistant commissioner, to be a woman, $4,000; three associate commissioners, $4,000 each; five deputy commissioners, salaries to be fixed.

Commissioner of prisoner, $6,000; advisory board of five members, two to be women, $2,000 each; two deputy commissioners, salaries to be fixed.

Commissioner of public welfare, $6,000; advisory board of six, unpaid; director of aid and relief, director of child guardianship, director of juvenile training, salaries to be fixed.

Commissioner of public safety, $5,000; state fire marshal, deputy chief of boiler inspection, board of boiler rules, 100 police officers for emergencies, salaries to be fixed.

Commissioner of public works, $8,000; four associate commissioners, $6,000 each; registrar of motor vehicles, salary to be fixed.

Commission of public utilities, chairman, $10,000, and four commissioners, $5,000 each.

Commissioner of metropolitan district, $6,000; four associate commissioners, $1,000 each.

◆

The Highways Transport Committee in Peace

(Continued from page 40)

Railroad Administration, because it is important that the activities of the committee do not in any way conflict with the interests of already existing mediums of transportation, but that the motor truck be enabled to fill a field which cannot be adequately filled by other means of transportation, so that through one of the various mediums all sections may have the transportation required. In matters of this kind the services of Dr. MacElwee, of the Department of Commerce, are especially valuable, as this department has specialized along these lines of thought.

While the Committee, as stated, does not undertake, of itself, the study of engineering problems, nor does it assume the responsibility of standing sponsor for types or methods of road construction, it nevertheless keeps constantly in touch with problems of this nature, and, in this particular, Mr. Goodell, of the Bureau of Public Roads, is of very great service to the Committee and the public. We endeavor to keep in touch with all findings of engineers on types of road construction and on the results of experiments made on road resistance, gradients, curves, etc., which develop from the various forms of road building. In all of this work, we, of course, endeavor to keep in constant touch with the various state highway departments and to work in entire sympathy and cooperation with them, feeling that the committee can attain its greatest usefulness by cooperation with all those who are interested in kindred problems.

In the matter of uniform traffic laws, it has been the effort of the committee to draw together the various interests who are concerned with such laws, for, unfortunately, there are at times conflicting ideas as to what laws can be best adopted. The study of this problem is one of the most important studies that can be made, and while it is perhaps too much to hope that all states will adopt any one set of laws, the nearer that they can be brought to a common basis, the more hopeful we can be that eventually substantially uniform laws may be adopted throughout the country.

The Committee has already proposed, after consultation with substantially all the police traffic regulation authorities in this country, a set of police traffic regulations which have been sent out, with their approval, to all state and municipal authorities, with the suggestion that they form a standardized basis upon which police traffic regulations can be framed. These regulations have met with ready approval, and are being adopted substantially as compiled, by many of the more important traffic centers in the country.

In order that the Committee might reach all states and all communities, there were formed, early in its existence, state transport committees in the various states of the Union. After the armistice, many of these committees turned their work over to bodies who would work under the direction of the Highways Transport Committee of the Council of National Defense, because the membership of the state committees consisted of volunteer workers who felt that they must return to their private affairs, once the war was terminated. These committees, or their successors, formed the channels of communication between the main Committee in Washington and the various states; and in a large percentage of the states, the chief highway authority is either chairman of the state committee or a member of it. This insures a cooperative relation between the parent Committee and its associated state committees.

Among the activities of a minor or contingent nature might be mentioned a study of the movement for the development of roads and transportation facilities to serve those farming areas on which it is hoped to place many of our returning soldiers and sailors. This, of course, is a development of the idea contained in the advancement of rural motor express.

Another survey that is contemplated is one to determine to what extent development of highways transportation could be of value in making available mineral deposits, in various localities; not with the idea that they should be transported to their ultimate destination over the highways, but that feeder lines might be established to the main railway and electric lines. This phase of the work is particularly applicable to wagon coal mines, and we have instances of where many large oil operations are possible because highway transportation provides means for shipping tools and equipment to certain oil producing areas.

Another activity which is unspectacular, but which is of unquestioned value, is that of organization to keep the highways clear of snow. Such work is of particular value in our northern and northeastern states, where snow removal is, in certain seasons, a very serious problem. While to one who has not studied the matter this does not appear a serious proposition, yet it is true that the closing of a road for a single day on account of snow is a serious economic loss to the communities affected.

The channels of communication which the Committee employs to transmit to those interested matters which affect highway development and use are frequent bulletins to all highway committees and authorities, chambers of commerce, automobile associations and similar bodies; publicity which can be obtained through the public press whenever matters that affect the public welfare are to be presented and through the various trade journals which are continually in search of useful and helpful material to present to their readers.

The cardinal principle of the Committee is a desire to be helpful to the various states and the communities thereof, for as a resultant of the benefit to the state and the individual the nation at large must gain. Unquestionably the development of road improvement and an intelligent use of the roads is one of the next great industrial developments, perhaps the greatest to take place in this country.

People are beginning to realize that poor roads mean a restriction of the social and commercial opportunities of life, and that good roads mean quicker transportation and cheaper transportation, a saving of labor, and the consequent opening of new channels of employment, and broader and nearer markets; and that they are the avenues of a wider and better social relation.

Roads to be of value must be used, and the Highways Transport Committee of the Council of National Defense can render a real public service by a study of how the roads can be best used to promote the social, industrial and commercial welfare of the nation, and by presenting, so that all may understand, what road development and use can contribute to the material prosperity and contentment of the people.

The real purpose of the Committee might be termed a study of the philosophy of the whole subject in all its aspects, with particular emphasis on the value of well-considered road improvement; the essential nature of road maintenance, for road improvement without adequate provision for road maintenance is an economic waste; and an educational campaign to set the matter properly before the public and the motor truck manufacturers and operators, for only by a cooperative interest between these elements can we hope for developments which will serve the common good.

Uses of the Motor Truck in Highway Work

(Concluded from page 44)

with trailers to carry snow away from the streets of cities, but they are also equipped with plows and employed for clearing both city streets and country roads.

Great as has been the use of the motor truck for road building, a much wider and more diversified use may be expected in the future. The labor situation is such that road builders must turn more and more to machinery, and as the science and art of road building develop more and more uses will be found for the truck and the trailer.

Federal Aid in June

Number of Projects Approved Again Exceeds Record for Any Previous Month

During the month of June, the Secretary of Agriculture approved project statements for 133 federal aid projects involving the improvement of 1,390.29 mi. of road at a total estimated cost of $24,220,808.90 and calling for federal aid amounting to $11,034,289.12. This is a record in the number of project statements approved; total cost, and amount of federal aid requested.

During the month, the Secretary and the state highway authorities of the various states executed 60 project agreements, involving the improvement of 507.31 mi. of road. The total estimated cost of the work covered by these agreements is $7,566,089.32, and the amount of federal aid called for is $3,404,269.18. In addition to these 60 project agreements executed, 40 agreements previously executed were amended during the month.

The total number of project statements approved up to June 30, is 1,319. These involve 12,790.37 mi. of road, a total estimated cost of $133,833,300.67, and federal aid to the amount of $54,763,957.81. At the same date, 667 project agreements had been executed, covering the improvement of 5,776.39 mi. of road costing $56,367,334.94 and calling for federal aid to the extent of $23,892,740.97.

The State of Virginia will expend about $60,000,000 for road construction during the next six years, according to a recent report. This estimate is based on securing $10,000,000 from the Federal Government.

MEETINGS

Calendar of Coming Meetings

Aug. 6-8.—North Carolina Good Roads Association.—Annual convention, Wrightsville, Beach, Wilmington, N. C. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

Nov. 12-14—American Society of Municipal Improvements.—Annual convention, New Orleans, La. Secretary, Charles Carroll Brown, 304 East Walnut St., Bloomington, Ill.

Feb. 9-13, 1920—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

American Road Builders' Association

The seventeenth annual convention of the American Road Builders' Association will be held at Louisville, Ky., on Feb. 9, 10, 11, 12 and 13, 1920.

In connection with this meeting of the Association, which will be the Tenth American Good Roads Congress under the auspices of the A. R. B. A., there will also be held the Eleventh National Good Roads Show. At the 1918 and 1919 meetings, the show feature of the congress was confined to small exhibits that could be accommodated in the hotels in which the meetings were held. The conditions which led to the adoption of this plan no longer existing, it is proposed to make the 1920 show similar to the complete exhibits that were held previous to 1918. Moreover, because of the reawakened interest in road building and the enormous expenditures which are going to be made in the next few years, the officials of the association expect to get together an exhibition that will surpass even those of former years.

The decision to accept the invitation extended by the City of Louisville was reached at a meeting of the board of directors at which invitations from many other cities were considered. It was felt that Louisville, because its central location and its accessibility from all parts of the country would meet the requirements of the 1920 convention better than almost any other city. In addition, the 1919 convention was held in New York, and it was felt that the national character of the Association compelled the holding of next year's meeting farther west.

Both the sessions of the convention and the exhibition will be accommodated in the First Regiment Armory. About 53,000 sq. ft. of floor space will be available and plans of the exhibition hall will be prepared and issued in the near future. As the armory is situated within two or three blocks of the leading hotels of the city, the officials of the Association feel that the facilities for the meeting are very nearly ideal.

The program, as in years past, will cover every phase of highway construction and maintenance and various related subjects. The prepared papers and the discussions will deal with highway problems from the points of view of road and street officials, highway engineers, contractors, and all of the various classes actively engaged in highway work.

At no previous time in the country's history has road betterment been the subject of so great general interest as at present, nor have the expenditures for the improvement of the country's roads ever been so great as those which will be made within the next few years. During the next year there probably will be available almost a billion dollars for road and street work, and the prospects are bright for even greater expenditures in the near future. For these reasons it is believed that the Louisville convention will be the most important ever held, both in point of attendance and in the interest shown.

Blue Island Automobile Club

Consideration of the condition of the Dixie Highway and other roads in the neighborhood of Chicago, Ill., occupied a large portion of the time at the reorganization meeting of the Blue Island Automobile Club held at that city on July 14. Resolutions to the effect that the club attempt to secure a part of the state and county appropriation for road work in the Blue Island section were adopted.

Among the speakers were William G. Edens, President, Richard J. Finnegan, Vice-President, and Henry Paulman, Chairman of the Finance Committee, respectively, of the Illinois Highway Improvement Association.

Mississippi River Scenic Highway Association

An organization meeting of the South Central Division of the Mississippi River Scenic Highway Association was held at Cape Girardeau, Mo., on July 15 and 16.

The prime object of the South Central Division is to further the development of the King's Highway from St. Louis to the Arkansas line, passing through St. Louis, Jefferson, Ste. Genevieve, Perry, Cape Girardeau, Scott, New Madrid, and Pemiscot Counties. About 50% of the King's Highway, which is said to be the oldest road west of the Mississippi, has already been hard-surfaced.

During the first day of the convention an inspection tour over the highway from Cape Girardeau to the big diversion channel of the Little River drainage district was made by the delegates. Among the speakers at the meeting were E. T. Fairchild, of Muscatine, Ia.; L. J. Brooks, of the St. Louis Automobile Club; A. J. Donaldson, and W. R. Hayley, of Memphis.

Officers were elected as follows: President, Charles McMullen, Sikeston, Mo.; Vice President, J. P. Reynolds, Caruthersville, Mo.; Second Vice President, Joseph Wilder, Ste. Genevieve, Ark.; Secretary, S. P. Browning, Blytheville, Ark.; and Treasurer, H. L. Albert, Cape Girardeau, Mo.

PUBLICATIONS

MASSACHUSETTS, SOMERVILLE, STREET COMMISSIONER. Annual report for the year of 1918. Paper, 6x9 in., 23 pages and covers.

This report contains a general summary of the work of the year, followed by several pages of tabular data on public and private streets in the city.

ALASKA, BOARD OF ROAD COMMISSIONERS. Report on the Construction and Maintenance of Military and Post Roads, Bridges and Trails. Extracts from the annual report of the Chief of Engineers, United States Army. Paper, 5¾x9 in.; 24 pages and covers; illustrated.

This report contains the roster of the Board of Road Commissioners for Alaska, several pages describing road conditions in the territory, and a detailed report on the operations for the fiscal year ending June 30, 1918. The report is illustrated by several half-tone reproductions of photographs of Alaskan roads and bridges.

EQUIPMENT—TRADE—MATERIALS

New Stone Spreader

A new two-way high or low speed stone spreading trailer is shown in the accompanying illustration. The machine is designed for use with motor trucks in the construction of highways.

It is of the bottom dump type, having doors operated by chains, as shown. The doors can be adjusted to any desired opening, permitting the discharge of any required amount of stone. It is equipped with roller bearing axles and rubber tires and can be operated in either direction. The illustration shows the 3½-yd. size. It is also built in 1½-yd. and 2½-yd. sizes.

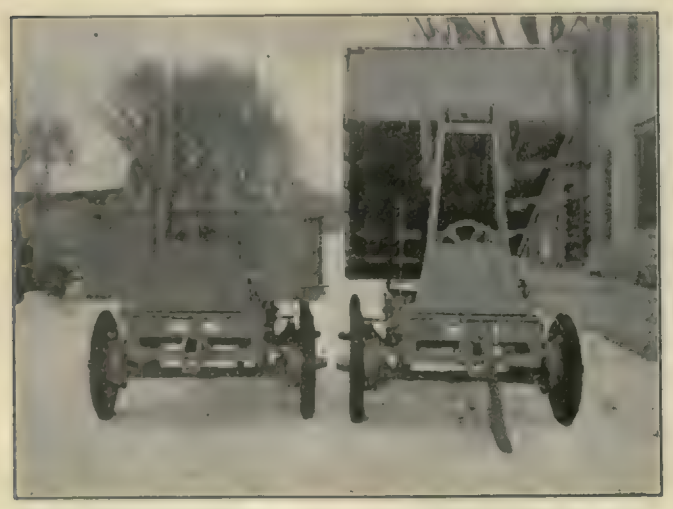
"EAGLE" STONE SPREADING TRAILER.

The spreader is manufactured by the Eagle Wagon Works, of Auburn, N. Y.

Trailer for Road Building

A type of trailer designed especially for hauling materials in road building is shown in the accompanying illustration.

The trailer is equipped with a steel dump body, operated by a hoist, as shown. It has rubber tires and has a capacity of 4 tons. According to the manufacturer, it can be operated with a 3-ton truck at a total cost of about $2.50 per day on a basis of 50 mi. daily.



"HIGHWAY" TRAILER.

The machine is known as the Highway trailer and is manufactured by the Highway Trailer Co., of Edgerton, Wis.

The Board of Directors of the Lime Association will hold its next meeting at the Traymore Hotel, Atlantic City, N. J., on the forenoon of Friday, Aug. 1. This is to be a very important meeting, as it is expected that plans for the future conduct of the association will be formulated by the directors for submission to the membership.

"Highway Construction" is the title of "Industrial Bulletin No. 30," recently issued by the Thew Automatic Shovel Co., of Lorain, Ohio. The booklet is 8½ x11 in. in size and consists of 20 pages, including covers. Its contents include a "good roads creed" and a page devoted to the importance of good roads, the remainder of the book being given up to a description of Thew shovels and their uses in road construction. The bulletin is profusely illustrated by views of roads and road work, many of them showing Thew machines in operation. It is printed on paper of especially good quality and in two colors.

PERSONAL MENTION

E. S. Brewer has resigned as city engineer of Owosso, Mich.

C. E. Hoff has been appointed engineer of Bexar County, Texas.

M. W. Strait has been appointed city engineer of Anderson, S. C.

E. J. Von Zuben has resigned as city engineer of Fort Worth, Texas.

J. F. Witt has resigned as county engineer of Dallas County, Texas, to engage in private practice.

Nelson I. Raymond has been appointed city engineer of Owosso, Mich., succeeding E. S. Brewer, resigned.

Fred Older, of Adrian, Mich., has been appointed city engineer of Ypsilanti, Mich., succeeding W. R. Caldwell.

Walter Frickstadt has resigned as assistant city engineer of Oakland, Cal., to enter the Bureau of Public Roads as senior highway engineer.

Earl Storer has been discharged from the 303d Engineers and has returned to his position in the engineering department of Mercer County, New Jersey.

Lieut. J. H. Briggs has been made Manager of the Texas Bitulithic Co., at San Antonio. Mr. Briggs served in the Aviation Section of the Army during the war.

James P. Nash, Office Engineer of the Texas State Highway Department, has resigned to engage in private practice, as a member of the firm of Bryant, Huffman & Nash.

W. Thomas Wooley, formerly city engineer of Auburn and of other New York cities, has been appointed engineer in charge of construction of the new state prisons at Sing Sing and Wingdale.

GOOD ROADS

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*Illustrated Article

Dust Preventives and Road Binders

By PREVOST HUBBARD

Chief, Division of Road Materials Tests and Research, United States Office of Public Roads.
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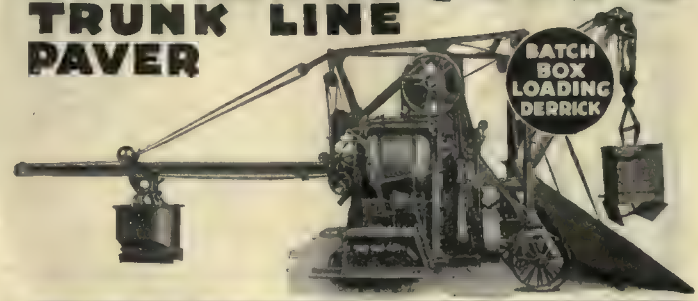

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CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVI.
New Series, Vol. XVIII.

NEW YORK, JULY 30, 1919

Number
5

Convict Labor on Highways Good Business

Experiences of Highway Officials in Many States Demonstrate the Efficiency and Economy of Prison Labor on Roads and the Physical, Mental and Moral Benefits Accruing to the Convicts

Convict labor on road work has been eminently successful in this country in the opinion of the highway officials of many of the states in which it has been given a trial. The work done by the convicts has been satisfactory in practically every instance in which competent supervision has been provided and the costs have been as low as those of similar work carried on with free labor under like conditions, and in not a few cases they have been even lower. The effects upon the convicts have been almost universally beneficial.

Among the state highway officials whose views on convict labor are given in a series of articles in a recent issue of "Public Roads," the periodical issued by the Bureau of Public Roads of the United States Department of Agriculture, are A. D. William, the former Chairman of the West Virginia State Highway Commission; B. M. Atwood, former state engineer of Arizona; H. C. Smith, Assistant Highway Engineer of the Oklahoma Department of Highways; William F. Cocke, State Road Commissioner of Florida; Clifford Older, Chief Highway Engineer of Illinois; Duncan Buie, State Highway Engineer of Louisiana; I. W. Patterson, Chief Engineer of the Board of Public Roads of Rhode Island; W. G. Thompson, State Highway Engineer of New Jersey; Z. E. Sevison, Former State Highway Engineer of Wyoming; Ira R. Browning, State Road Engineer of Utah; H. C. Allen, Former State Highway Engineer of Idaho; and George E. Johnson, State Engineer of Nebraska.

Extent of Use

In some of the states, convict labor has been used only a short time, though in many of them it long has been the

A CONVICT BUILT ROAD IN COLORADO—PARKDALE-COTOPAXI CUT-OFF ON THE "RAINBOW ROUTE."

policy of the state to employ prisoners in road work. In addition, many counties, particularly in the southern states, have utilized their prisoners very extensively in road work.

Arizona has used prison labor for the past ten years, employing convicts on practically all types of construction, including both road and bridge work. They have been employed both by the state and by the counties. In Oklahoma, the 1915 Legislature enacted a law enabling the State Highway Department to use state convicts in the building of state roads. The first convict camp was established in May, 1916, and up to this year 14 camps had been operated, with forces ranging from 15 to 100 men, each. Prison labor has been used to some extent on the roads of Florida, almost from the organization of the state, although it was not until 1910 that the counties began to make general use of their misdemeanor prisoners on their roads, and the use of state prisoners did not commence until 1915. A recent prison census showed that there were approximately 1,000 able-bodied male state prisoners and about 1,200 county or misdemeanor prisoners in the state. Nearly all the county prisoners and approximately 450 of the state prisoners were at that time employed on road work. The state convict road force was formally created by the Legislature of 1917.

The state of Illinois has utilized its prisoners in the preparation of road building material since 1906. During the period from 1913 until 1917, seven construction camps were operated in various parts of the state. The Louisiana State Highway Department utilized convicts in road construction from its establishment in 1911 until 1914. From then until 1918, convicts were not used on the roads because the number of available men was only just sufficient to meet the needs of the Board of Control of the State Penitentiary for labor at its plantations and in its several industries. In 1918, the department again secured prisoners and has used them when obtainable since that time.

Rhode Island utilized convicts on the public roads for the first time in 1917. In that year two convict camps of 30 men each were established, but none were employed last year, as nearly all of the prisoners were required for farm work at the prison. New Jersey made use of convicts in 1912 and has employed them more or less extensively since that time.

The first provision for the use of convicts on Wyoming roads was made by the Legislature of that state in 1911. Since then convict labor has been used extensively. In Utah, convicts have been used by the State Road Commission, especially in mountain construction. In Idaho, a convict camp was established in 1916 and convicts were used in several camps during the succeeding years.

Results Considered Successful

The officials who comment on the results of convict work are practically unanimous in reporting it as successful. Former State Engineer Atwood of Arizona says:

"I have no hesitancy in saying that convict labor may be made a source of profit to the state; that such labor can be so led as to produce the best quality of work; that a convict camp may be so managed as to be reasonably contented, cleanly, healthful and of assistance to the men in improving their moral and mental condition; and, furthermore, that whenever convict labor fails to achieve such results the methods and personnel of the management should be held accountable for the failure rather than the quality of the labor that is used."

In Oklahoma convict labor has been used chiefly in mountainous sections where the cost of labor is a large item in construction costs and, according to Assistant Highway Engineer Smith: "The roads built have been very satisfactory, having been constructed according to plans and profiles which had been approved previously by the Highway Department."

In discussing the results of convict labor in Florida road work, State Commissioner Cocke says:

"Owing to the character of men furnished for the state convict road force a comparatively small per cent. of trusties have been available. Although, the best grade of prisoners has not been provided and other conditions have been unfavorable, the success of the state convict road force is assured, and it is expected that the lease system will be entirely abolished and all of the able-bodied state prisoners placed on road work."

The experience of the Illinois officials has shown that better results can be secured when the men are given an opportunity to earn a little extra money, according to Chief Highway Engineer Older. He also says:

"Satisfactory results, however, have been secured without this incentive in the preparation of crushed stone and road building materials at the penitentiaries, and our experience indicates that this method of utilizing convict labor is preferable to construction camps."

Chief Engineer Patterson of the Rhode Island Board of Public Roads reports his observation of convict labor as follows:

"Our observation of the use of convicts for road work leads us to believe that convict labor is a success, and is a very practicable and humane method of employing the able-bodied inmates of our penal institutions. We believe that the best results are to be secured by the use of convicts of middle age. We do not feel that the employment of convicts under 30 years of age is advisable because of the fact that the younger convicts are less apt to be reconciled to their fate, and are, therefore, more apt to attempt to escape and less apt to evidence interest in their work.

"It appears to us highly desirable that some incentive for faithful work be offered convicts employed upon types of construction where careful workmanship is necessary in order to secure good results. We feel that a small money incentive to the convicts, a reduction of sentence for good behavior, and better food than as a rule prevails at prisons are feasible incentives.

"The efficiency of our convict gangs was impaired more or less by frequent changes in personnel. Care was not taken to send to our camps convicts whose terms did not expire until after the completion of the work. We feel that it is preferable to select convicts whose terms are relatively short, but that it is an advantage to select convicts whose terms are of sufficient duration to make unnecessary frequent changes in personnel of gangs."

Perhaps the best indication of the attitude of the New Jersey highway authorities toward convict labor is the statement that the system "will be expanded as rapidly as numbers of men available will permit, and existing laws are amended or modified to permit greater elasticity in the disposition of the men in the field, and a closer cooperation between the reformatory institutions and the Highway Department."

"Without question the use of convicts on road work in Wyoming has been a success, particularly on roads in mountainous country," reports State Highway Engineer Sevison. "It is expected that the use of convicts will be continued on road construction and it is hoped that conditions will be such in the other lines of work where they are employed that an additional number will be available."

State Road Engineer Browning of Utah reports as follows:

"The first two years during which such labor was employed resulted in such creditable road improvement as to establish definitely this type of labor for difficult rock work, heavy cuts and sidehill construction. One of the requirements in connection with convict labor in the mountain districts must be the compactness of organization in order to

CONVICT BLACKSMITHS ON A VIRGINIA ROAD JOB.

effectively guard the prisoners and prevent wholesale escapes from camp into the mountain fastnesses; and this naturally limits their work to heavy construction."

According to H. C. Allen, Former State Highway Engineer of Idaho, the labor performed by the convicts compared very favorably with free labor, but because of the divided responsibility in the organization, the results obtained were not the most satisfactory. At the same time, he says, it was felt by the authorities that value was received for the money expended. He adds:

"There is little doubt that with proper organization and when the work is within reasonable distance from the penitentiary the working of convicts could be made profitable to the state as well as beneficial to the men."

"Convict labor has been found profitable in the construction of roads in the state of Nebraska," according to State Engineer George E. Johnson.

Costs of Convict Work

Because of the varied conditions under which convicts are utilized in the different states, the different kinds of work done and various local conditions, there is a wide range of cost reported by the several highway officials who give cost data.

Former State Engineer Atwood of Arizona, in discussing the cost of prison labor, says:

"From the results obtained in Arizona in a period of nine years, we feel warranted in stating that the cost of work done by convict labor under our laws has been approximately two-thirds the cost of similar work under the day labor system. In comparing work done by paid labor under our own organization with work done under contract, we are inclined to the opinion that work may be done by prison labor for about two-thirds the cost of the same work under the contract system, provided the contractor carries on his work in an equally satisfactory manner and that his bid is a reasonable one, satisfactory to himself."

LOUISIANA CONVICTS AT A ROAD CAMP.

In Florida, according to State Road Commissioner Cocke, the cost of feeding, clothing and guarding convicts has increased so rapidly that it would be difficult to determine a fair average cost per man, but since the price of labor has about kept pace with the cost of living, he believes it would be safe to assume that the total cost per man has not exceeded 50% of the current wage for the same class of labor.

The construction camps in Illinois, according to Chief Highway Engineer Older, have been successful, both from the economic and humanitarian standpoint.

State Highway Engineer Buie, of Louisiana, discusses the cost of convict labor as follows:

CONVICTS PUTTING DOWN A CONCRETE FOUNDATION NEAR COLUMBUS, OHIO.

"At the present time the Highway Department would hardly venture to say just what it would cost to construct a metal-surfaced road with the use of convict labor, due to the fact that the hard-surfacing material available in this state for road building purposes consists mainly of gravel and what is known as 'commercial clam shells,' and the price of this material is constantly increasing. However, just as a comparison between the cost of construction with free labor and with convict labor: On a section of road where the Highway Department last used convicts and where a metal surfacing of clam shells was applied, and where the same material, prior to the use of convict labor was costing the Department and parish in the neighborhood of $4 per cubic yard, the same work was done for $2.60 per cubic yard.

"One of the principal factors in the reduction of the cost of the above construction was that the convict labor was on hand at all times, and when we were using free labor, teams and work were tied up, due to the fact that the free labor did not always return to the job."

State Highway Engineer Thompson, of New Jersey, in discussing the cost of work done by the convicts, says:

"Notwithstanding the difficulties under which work was done, there was performed during the construction season of 1915, $41,360.31 worth of work at a total cost of $38,840.57, value of the work done being based on the then current prices for the various items. The work performed included

(Continued on page 71)

How to Get Clean-Cut Grading Jobs*

Proper Methods in Light and Heavy Work—Tractor and Grader Operation—Right Machinery and Capable Men Are Indispensable

By F. F. MENGEL†

This topic has been presented to you at nearly every road school in the past, and is of such vital importance that it will probably be brought up at every road school in the future. We can truly say that the grading is the only permanent part of any road job; no matter what kind of surfacing we use, we expect it to wear out, but the grading is a permanent feature. No matter what kind of surfacing we use, the general appearance of the road depends upon the kind of grading done. If the grading is ragged and unfinished, no matter how well the surfacing is placed, the completed job will have the same appearance.

At the present time we have two kinds of grading jobs: (1) Light grading or gang maintenance, really amounting to heavy blade grader work supplemented by wheelers, and (2) heavy grading where large cuts and fills are made.

The heavy blade grader work, which has been done this year with a 10-ft. blade grader hauled by a tractor of 30 h. p. or more, supplemented by a small crew of wheel scrapers, has somewhat revolutionized our idea of grading. Heretofore, the policy of the Commission has been to make heavy cuts and fills, thereby reducing the grades. We have come to the conclusion that about 60% of the roads that are to be improved under the state aid law can be graded with an outfit of this kind, making small cuts and the necessary fills. This will produce a road that is very satisfactory to the traveling public, and will cut the cost of grading from 30 to 50%. This method not only effects a saving in cost, but also in labor, most of the work being done by machinery, thereby eliminating considerable hand and team labor. This is an important consideration, especially when men and teams are scarce. This was demonstrated last year. Counties that had outfits of this kind were able to grade many miles of road, while those that did not own outfits were not able to do much.

We believe that the saving in the cost and labor, coupled with the fact that we will get nearly twice as much road for the money, warrants a change in policy for the next few years, except where permanent surfacing is to be placed on the road. State aid construction will be planned along these lines. It may appear to you that we are loosening up on our standards, but I believe that the character of the work that will be done will be as good as in former years and in some ways, better. We will have a wider road to travel on, but the grades will not approximate railroad grades, as they have heretofore.

Where we expect to do heavy grader work, the entire job should be staked out in advance, or at least it should be staked from ½ to 1 mi. ahead of the crew, depending on turning places. If the survey has been made, it is an easy matter to set the center line stakes by measuring the proper distances from the survey stakes. If no survey has been made, and it is impossible to get an engineer with a transit, the center line should be determined by setting a long pole at the top of a hill or at the bend of the road where the ends of the tangent will be, and then lining in shorter stakes between the ends of the tangent. These stakes can be set from 100 to 500 ft. apart as circumstances warrant. The ditch line should then be staked out by measuring out the proper distance from the center line stakes. In all cases the stakes on the ditch line should not be over 100 ft. apart. The cuts and fills are small and it is not necessary to set slope stakes.

Where considerable clearing and grubbing have been done on the sides to widen out the road, and the ground is left in an uneven condition, it is necessary to plow a furrow at the ditch line, following the stakes that have been set. It is absolutely necessary that this furrow be straight if you expect to get a clean-cut job, and where the ground is very uneven, we have found that it is advisable to have a man lead the team while plowing the furrow. Where the ground is fairly even, it is not necessary to plow; a good grader operator can cut a straight ditch line using the stakes as a guide. In making the first cut, the grader blade should be set so that the grader will cut like a plow, keeping the heel of the blade about as high as you can get it.

The final appearance of the road and its cost depend upon the grader operator that you have. The best man that you can get is none too good. He should have a good eye and be familiar not only with the operation of the grader, but the engine. Most operators try to do too much, especially with the first cut. The most successful operators take a light cut first, keeping the heel of the blade rather high. In other words, they shave off the sod, cutting it as thin as possible. When the first cut is carried to the shoulders in this manner, what sod has not been lost in stump holes and uneven places in the road, is ground and mixed with earth by the combined action of the grader and tractor. A good operator not only watches the ground ahead and shifts his blade accordingly, but he also watches the engine so as not to overload it, this factor being somewhat obviated where a large sized tractor is used.

Personally, I am of the opinion that much time is lost if anything less than a 30 h. p. engine is used. Time is lost pulling out of bad places, the operator is unable to cut off the high points while taking the regular cut, and a tractor will last much longer if it is run at 75% capacity, using the reserve power for emergencies. The 10-ft. blade grader will work very well with the above described tractor, being neither too light nor too heavy. It has a long wheel-base and will move a large amount of earth if properly handled. The best time to make the necessary cuts and fills is after the second or third round has been completed and the loose dirt and sod, if any, have been moved to the shoulders. Wheel scrapers or fresnos can be used to move the loose dirt to make necessary fills and help true-up the cross-section. Three to five teams can be used to advantage to do this work, and the amount of work that they will do in a day is surprising.

The tractor and grader are, of course, always on the move, and we find that when 8 to 14 round trips have been made with 3 to 5 teams, working all the time, a very satisfactory roadbed will be secured at a minimum cost. The tractor outfit moves a little faster than 1 mi. per hour. Under good working conditions, if the outfit does not have to stop for repairs, a crew of this kind will grade 1 mi. in three days.

We have found that light soils can be graded with a heavy grader and tractor to advantage wherever there is any vegetation growing at the side of the road and there is some humus in the soil. In work on soils of this character it has been found that it is best to start the first cut just outside of the shoulder and bring the good dirt to the center, and make the next cuts farther out toward the ditch line, and finally out to the ditch line. The cut at the ditch line should never be more than 3 or 4 in. deeper than the good soil. In this way all of the good dirt on the road is brought to the center, the crown of the road being nearly flat. We find that the combined rolling and mixing action of the tractor and grader, mixing all of the dirt and packing it down, will make a very good road after a few rains, if the road is reshaped and dragged when it is fairly wet. It is possible to grade in this manner many sandy roads and get a satisfactory surface, which, if graded under the old system, would have to be surfaced.

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*Paper presented at the Eighth (1919) Annual Road School of the Wisconsin Highway Commission.

†Division Engineer, Wisconsin Highway Department.

In taking up the second class of grading, or heavy grading, I intend to bring out only those important points that have been neglected by the men in the field.

I wish to call to your attention the fact that different classes of roads and different soils have different cross-sections. The number of the cross-section to be used is always found under the title. In almost all of the plans the cross-section is shown under the grade sheet. If you expect to get any benefit from the plan, you must use the cross-section noted on the plan as conscientiously as you follow the center line and grade.

The question of staking out the road has been called to your attention many times, but in spite of this fact, we find many jobs where stakes are missing. A good many of the commissioners and foremen still believe that after the center line and ditch lines have been staked out, the staking is completed. For the convenience of the foremen, we have placed with the grade sheet an extra grade sheet showing the location of the slope stakes wherever the cut or fill warrants them. In order to get satisfactory and economical work, it is necessary that the slope stakes be set. When we first started out it was necessary for the commissioner or the foreman to figure out the location of the slope stakes, but at the present time all that is necessary to do is to measure out the proper distance from the center line stake; and this distance is shown on the grade sheet. We expect that when we get on to the grading jobs of 1919, where large cuts and fills are being made, all of the slope stakes will be set. You and I know that if the slope stakes are not set, the job is costing more money than it ought to cost, and that the foreman is probably losing for the county three or four times the cost of his daily wage each day.

We still find that many of the county highway commissioners and foremen are using the center cut and fill to grade with. The center cut and fill on the plan is only approximate and if you expect to grade to the lines shown on the plan it is necessary to set the grade stakes for cuts or fills by using one of the common methods of leveling over from the survey stakes.

The plans should be carefully consulted to find out which way to move the dirt. In many cases material is being hauled a longer distance than it would have been if the plans had been carefully consulted. On every plan at every cut, if there appears to be any doubt, a note is given showing which way the material is to be hauled. I wish to call to your attention the fact that all cuts should be opened full width, that is, from slope stake to slope stake, and that the cut should be carried down on the proper slope so that a minimum amount of hand work is required to finish the work. All fills should be started full width at the bottom and carried up in not to exceed 1-ft. layers. There may be extraordinary cases where this cannot be done, but they are scarce. If the fills are not made in this manner it is not only a costly proposition, but we get a poor road, which will result in the sliding off of fills, uneven settling, and a crooked guard rail. The fact that traffic is carried over the road while it is under construction is another reason why we should carry up the fills in 1-ft. layers. It makes it much easier for the traveling public to get over the road. For this reason all fills and cuts should be kept as smooth as possible and the road should always be left so that if it rains over night, it will drain properly and travel will be able to get over the road with the least possible delay. It also makes it possible to get back to work more the quickly. If the road is left open to traffic the traveler expects to get through. The road should never be left open if it is impassable. When we leave the road at night, all possible precautions should be taken so that it is not left in a dangerous condition. Often in 15 or 20 minutes, a couple of men can do much to make the road safe for travel, and it is our duty to see that this is done.

The last few dollars that are spent on any grading job should serve to top off the work like a good dessert with a Thanksgiving dinner. They serve to finish up the road. A good grading foreman has only a small amount of finishing work to do. The cuts and fills have the proper slope, and all that is necessary to be done is to trim off the ragged edges by hand and slope the banks of the ditches on grader sections. We have found that this latter operation can be done with a large 10-ft. blade grader if you have about 5 to 8 ft. clearance with telephone poles and fences, and with about 4 ft. clearance, if you have the right kind of an 8-ft. blade grader. If this cut is made at the finish of the work, we throw the dirt on the bank, which necessitates hauling away the extra dirt and sod. If it is made just after you have made your last ditch cut, it can be taken care of the same as any other sod. We feel that it is impossible to give too much attention to the finishing of the road. We do not slope the banks for appearance alone. If we do not give the banks the proper slope, nature will soon do it for us by filling in the ditches and narrowing up the fills, resulting in heavy maintenance costs. Special care should be taken during construction and on the completion of the work to see that all of the ditches drain properly. The biggest fault I have found with the heavy grading work this year is that in many cases ditches were left that would hold water and soak up the road. It sometimes happens that we are not able to tell until after a rain where the ditch holds water, but as soon as we find out, we should remedy it.

The finished road should conform to the cross-section desired. A few dollars spent in reshaping the road with a road grader will many times change it from a ragged looking job to a clean-cut job. We believe that a blade grader job should be reshaped as soon as it has had time to settle, and advise going back over the work, especially where we are grading long stretches.

In conclusion the only way you can get a good clean-cut grading job, is to have the right kind of an outfit, and men in charge who take pride in their work and will pay careful attention to the minor details.

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The authorities of St. Clair County, Illinois, are planning to expend about $2,500,000 for road work, according to recent advices. The county has already raised $1,500,000 by means of bond issues and the balance is to be obtained from state aid. The roads selected for improvement have already been approved by the Illinois Division of Highways.

The Townsend Bill providing for a national highway system has the backing of public opinion, according to the Federal Highway Council, which states that reports to that effect are being received from all parts of the country. These reports also indicate, it is said, that the true functions of local and long distance traffic lines are becoming better understood. It is also predicted that as soon as Congress disposes of other pressing matters, highway legislation will be taken up.

The Asphalt Industry in 1918

Value of All Products and Amount Sold for Highway Work Exceed Records of Past Years

The value of the output of the American asphalt producers during the year of 1918 was greater than that in any preceding year, and the amount sold for road building also exceeded the amount sold in any one year preceding the war, although the total amount produced was slightly less than in 1917. These records were made in spite of restrictions upon the importation of native asphalt and of the very material curtailment of road building during the year, according to a report on the American asphalt industry in 1918 by the Geological Survey of the Department of the Interior.

Use of Asphalt in Paving

The chief use of asphalt in this country is in paving city streets and country roads, according to the report, and not only was the amount used for this purpose in 1918 greater than the amount used in any previous year, but the prospects for the future are very encouraging. In support of this view, the situation in the City of Washington, D. C., is cited. The conditions there, it is stated, "are similar to those in many other typical American cities." It is reported that more than $500,000 worth of pavements will be laid there in 1919, and that this will be a record for the city. There are about 350 mi. of pavements in the city, according to the report, and asphalt is a popular paving material.

Statistics of Production in 1917 and 1918

Detailed figures on the asphalt and allied substances produced and imported in the United States in 1918 are given in the accompanying table which is taken from the report. While the total production in the United States in 1918, 1,237,853 short tons, was less by 190,473 short tons, or about 13%, than the output in 1917, the value, $18,540,032, represents an increase of $2,627,604, or approximately 16.5%. The imports of crude native asphalt and allied substances in 1918, amounting to 115,663 short tons, were less by 72,702 tons, or about 39%, than those in 1917, and the value, $814,752, was less than that of the imports in 1917 by $305,105, or 27%. The resumption of normal conditions, according to the report, is expected to restore the imports to pre-war proportions. The petroleum asphalt, including road oils and fluxes, produced from oil of domestic origin in 1918 decreased about 25% as compared with 1917, while the value decreased only about 4%. On the other hand, similar materials manufactured in this country from Mexican petroleum increased about 1% in quantity and nearly 39% in value.

ASPHALT AND ALLIED SUBSTANCES PRODUCED AND IMPORTED IN THE UNITED STATES IN 1918.

Variety	Production		Imports		Total	
	Quantity (short tons)	Value	Quantity (short tons)	Value	Quantity (short tons)	Value
Domestic petroleum asphalt:						
Paving asphalt	164,704	$2,418,531	......	......	164,704	$2,418,531
Binders and fillers	16,841	272,842	......	......	16,841	272,842
Other solid and Semi-solid products	96,621	1,680,369	......	......	96,621	1,680,369
Road oil	78,830	808,038	......	......	78,830	808,038
Flux	160,187	2,117,889	......	......	160,187	2,117,889
Other liquid products	10,392	137,535	......	......	10,392	137,535
	527,575	$7,435,204	......	......	527,575	$7,435,204
Mexican petroleum asphalt:						
Paving asphalt	79,884	$1,255,853	......	......	79,884	$1,255,853
Binders and fillers	68,638	1,029,230	......	......	68,638	1,029,230
Other solid and semi-solid products	189,859	3,690,138	......	......	189,859	3,690,138
Road oil	28,501	404,720	......	......	28,501	404,720
Flux	189,460	2,432,160	......	......	189,460	2,432,160
Other liquid products	93,902	1,511,919	......	......	93,902	1,511,919
	650,244	$10,324,020	......	......	650,244	$10,324,020
Total petroleum asphalt	1,177,819	$17,759,224	......	......	1,177,819	$17,759,224
Native asphalt	......	......	114,686	$624,967	114,686	624,967
Gilsonite	30,848	606,639	......	......	30,848	606,639
Grahamite and elaterite	3,803	36,532	......	......	3,803	36,532
Bituminous rock	25,346	92,238	39	2,538	25,385	94,766
Ozokerite and other mineral wax	37	45,399	905	147,805	942	193,204
Ichtyol and ichtyol substitutes	......	......	33	39,452	33	39,452
	60,034	$780,808	115,663	$814,752	175,697	$1,595,560
Grand totals	1,237,853	$18,540,032	115,663	$814,752	1,353,516	$19,354,784

Pennsylvania Township Reward Law

New Road Legislation Providing Cash Rewards Supersedes Former Bonus Law

A bill providing for state rewards to townships for the construction and improvement of township roads and for the building of township bridges in townships of the second class has been signed by Gov. Sproul of Pennsylvania. The bill carries an appropriation of $1,000,000 which will be available after Dec. 1, 1919, and takes the place of the law which provides bonuses of 50% of the amount expended by townships for road work, with a limit of $20 per mile.

Under the new law the state will pay rewards to townships upon the completion of improvements of the following nature: Grading and draining a section of road not less than ½ mi. long; graveling or cindering a graded and drained road not less than ½ mi. in length; macadamizing a road or constructing a Telford macadam road not less than ½ mi. long; constructing a concrete, brick or bituminous surfaced road of not less than ½ mi. in length; the erection and construction of bridges 3 ft. or more in span, constructed of concrete or stone or a combination of concrete and stone, or a steel bridge with a floor constructed of materials approved by the State Highway Department; and the purchase and installation of culvert and drain pipe.

The rewards are to amount to 33⅓% of the cost of the improvements but are not to exceed certain specified sums. The rewards are based upon roads improved to a width of 16 ft., reductions or additions in the amount of reward being made as the width is increased or reduced. No rewards, however, are to be paid for the improvement of roads to a width of less than 12 ft.

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The Voters of California approved a $40,000,000 state highway bond issue by an overwhelming majority, according to a recent report. It is expected that the funds from the issue will suffice for the addition of 1,510 mi. of road to the state highway system and also for the completion of about 630 mi. of work begun under previous issues.

GOOD ROADS

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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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ASPHALT PRODUCTION AND USE IN 1918 AND THE PROSPECTS FOR THE FUTURE

Figures that may be surprising to some not thoroughly familiar with road work in the United States during the past year are given in the United States Geological Survey's report on the American asphalt industry in 1918, which is reviewed on another page of this issue. According to that report, in spite of the curtailment of road work in 1918, "a larger quantity of paving asphalt, binder, filler, road oil and flux was made from petroleum and crude native asphalt and sold last year than had been sold in any one year preceding the war."

The report also shows that the total production in 1918 was less than that in 1917, but that the higher prices of the products resulted in a material increase in the total value of the output.

Not only was the industry prosperous during 1918, but the outlook for the domestic asphalt industry, the report states, "is very encouraging." This, we believe, agrees with the other indications. It is generally accepted as a fact that the close of the present road building season will mark a record in road work. The movement for road improvement is reacting from the artificial repression of the past two years, and unusually large sums are being appropriated. Asphaltic materials of various kinds have always held a very important place in the paving and road making industry and appear to be growing in popularity.

Another factor that should exert considerable influence in increasing the use of these materials is the recent formation of the Asphalt Association, the prime object of which is naturally to promote the use of asphaltic materials. Organizations of this kind can do much in molding public opinion and can accomplish even more by the work which they can—and frequently do—perform in developing methods of construction and maintenance with the materials they are promoting.

With the advantage of popular favor already enjoyed by asphaltic roads and streets, the Asphalt Association should be able to carry on a campaign resulting in benefits not only to the producers, but also to all users of the roads.

CONVICT LABOR UNDER EXPERT SUPERVISION

Testimony by road officials who are in positions enabling them to speak with authority is favorable to convict labor in highway work. This applies not only to the matter presented on other pages of this issue, but also other similar data made public in the past.

The chief difficulty—or, at least, one of the greatest difficulties—in the prosecution of road work at the present time is the lack of common labor. There are plenty of able contractors and enough work to keep them busy.

One of the most essential factors in the performance of work with convicts is efficient supervision. Naturally, the management of convict work falls almost wholly upon the engineers of the state and county highway departments. However able these men may be, as engineers, few of them have the kind of ability that a contractor must have to successfully handle construction work.

These facts immediately suggest the possibility of devising some plan by which a state or county may put a responsible contractor in charge of work and supply prisoners to carry it on. It is realized that there would be certain objections and difficulties to be overcome, but it is believed that these would not be insurmountable. Under such an arrangement the state or county could not only utilize its convicts, but could also avail itself of the contractor's experience and his plant.

"JOY RIDE" MILEAGES

Thirty-eight miles are covered on the average evening "joy ride" of the car owner of a city in the Middle West, according to the results of a recent investigation. The figures are from a city of about 300,000 population and the inquiries upon which they were based were made of some 250 motorists.

This estimate means something to the road builders of the country, for it hints at the enormous traffic they have got to take care of.

There are at least 6,000,000 automobiles in the United States. During that part of the year when evening rides are pleasant, and especially during the midsummer months, considerable numbers of these pleasure cars or passenger cars—as they are sometimes called—are used for so-called joy rides after the day's work. Just what percentage of the total number is so employed is uncertain, but assuming that the proportion is 1 in 10, the daily average would be about 600,000. If the trip mileage of 38 is a fair figure, the daily mileage would be 22,800,000. Again, assuming that this holds only for three months of the year—90 days—the yearly mileage would be 2,052,000,000. As there are only about 2,500,000 mi. of road in the whole country, this means that if the roads were all equally used, each mile would be traversed something over 9 times daily or over 800 times in the season. Of course, the roads are not equally used; this traffic is all carried on a small percentage of the roads, which means that the density of traffic is much greater than indicated.

So uncertain are the assumptions upon which the computation is based that the final figure may be either high or low; probably, however, it is conservative. At any rate, it gives an inkling of the magnitude of one class of traffic.

Road Funds in North Carolina

Bond Issues Aggregating About $15,000,000 and Other Funds Make Over $20,000,000

On May 1, there was available in North Carolina, $6,505,000 from bond issues which had been voted upon, according to a tabulation of county and township bonds printed in a booklet recently issued by the North Carolina Good Roads Association.

In addition, county authorities had been authorized to issue bonds to the amount of $6,690,770, and elections were pending involving bond issues amounting to $3,755,000.

In addition to these bond issues, there will be available during the next 16 months about $3,000,000 of federal aid and about $3,000,000 from appropriations authorized by the Legislature of 1919, making the total sum available for road work about $22,000,000.

Convict Labor on Highways Good Business

(Continued from page 67)

earth and rock excavation, construction of macadam pavement, operation of stone crusher and quarry; construction of reinforced concrete culverts, etc."

Referring to the work of convicts in the construction of a broken stone road with tar binder in 1917, Mr. Thompson says:

"A camp holding 50 men was established near the work, to and from which the men were transported each day in motor trucks. The State Highway Department paid the reformatory authorities $1.75 per man per day, of which each man received 50 ct. when his work was satisfactory. The work performed by these men was so unusual in quality and quantity as to cause much comment, especially when compared with free labor employed in the cantonment construction near by, and paid from $3.50 to $4.50 per day. On the work, the guards employed by the reformatory acted as foremen and were paid by the Highway Department. The reformatory fed and clothed the men out of the $1.75 per day."

He also says: "Of the value of the labor there is no doubt. A decision after comparison between the labor of these men at $2 per day and the general run of free common labor at from $3.50 to $4 per day is decidedly in favor of the inmate labor."

Effects Upon the Convicts

When reports are made upon the effect of road work upon the prisoners there is little difference of opinion, practically all those having experience with convict work being of the opinion that the work has been of great benefit physically, mentally and morally. Some of the comments on this phase of the matter are as follows:

Former State Engineer Atwood, of Arizona: "There is no doubt that the moral and physical tone of the men employed on the state highways has been much improved by taking them away from the surroundings of the state prison and keeping them actively employed in the open on work that is interesting, more or less arduous, and healthful in its nature. The benefits derived along these lines by the prisoners themselves are worthy of consideration and undoubtedly can be greatly increased."

State Highway Engineer Duncan Buie of Louisiana: "The work in the open air adds to and improves the physical and mental condition of the convict. Being constantly on the job, in time he becomes an expert in his line, whether it be wheeler work, handling a shovel, or working a drag. Through experience he knows just how to go about it, and this also is a time saver and reduces the cost of construction."

Chief Engineer I. W. Patterson, of the Rhode Island Board of Public Roads: "We are gratified to note that a number of the convicts employed upon road work in 1917 and whose terms have expired since have been employed by contractors or by this department upon road work. We have no data available to show the exact number of the convicts who since their release have taken up road work as a means of livelihood, but we know that a considerable number have done so. Several of the former convicts now employed on road work have expressed themselves as very appreciative of the experience obtained at the camps, which has enabled them to qualify as experienced laborers."

W. G. Thompson, State Highway Engineer of New Jersey: "From a sociological point of view, the benefits are inestimable, as the men are employed regularly in the open air amid healthful surroundings, as opposed to the old system of hiring them to contractors within the instituions. Considering the number of men employed on the highways, very few have attempted or effected clean escapes.

"Facilities are provided for athletics, in which the men are permitted to indulge on Saturday afternoons and Sundays. These help to maintain the general morale, and give the men something to look forward to."

More Pennsylvania Contracts

Bids for the Construction of About 60 Miles of Highways To Be Received on August 5

In addition to the bids called for July 29, which were noted in "Good Roads" for July 16, bids for about 60 mi. of highway in various part of Pennsylvania will be opened by the State Highway Department on Aug. 5. The locations and designations of the roads, the lengths in feet and the types of construction called for are as follows:

Beaver County, Applications 204 and 455, Pulaski and Daugherty Townships, 6,788 ft., 1-course reinforced concrete; Bedford County, Route 286, Woodbury Borough, 2,414 ft., 1-course reinforced concrete; Cambria County, Route 276, Croyle Township, 6,634 ft., 1-course reinforced concrete and hillside vitrified brick; Centre County, Route 57, Rush Township, 12,355 ft., 1-course reinforced concrete or bituminous surface course on a concrete foundation; Clearfield County, Route 59, Lawrence and Pike Townships, 17,977 ft., 1-course reinforced concrete; Clearfield County, Route 59, Brady Township, 8,118 ft., 1-course reinforced concrete and hillside vitrified brick; Clearfield County, Route 57, Chester Hill Borough, 4,333 ft., 1-course reinforced concrete; Clearfield County, Route 60, Sandy Township, 13,027 ft., 1-course reinforced concrete and hillside vitrified brick; Erie County, Route 87, Northeast Township, 18,940 ft., bituminous surface course on a concrete foundation or 1-course reinforced concrete; Fayette County, Route 247, Dunbar Township, 5,950 ft., 1-course reinforced concrete and hillside vitrified brick; Indiana County, Routes 54, 63 and 67, Indiana Borough, 8,188 ft., 1-course reinforced concrete; Indiana County, Application 694, Blairsville Borough, 3,812 ft., 1-course reinforced concrete; Lackawanna County, Route 168, Elmhurst Borough, 7,538 ft., bituminous surface on a concrete foundation; Lycoming County, Routes 240 and 19, Muncy Creek and Wolf Townships, Muncy and Hughesville Boroughs, 24,226 ft., bituminous surface course on a concrete foundation or 1-course reinforced concrete; Lycoming County, Route 23, Piatt and Porter Townships, and Jersey Shore Borough, 14,284 ft., bituminous surface course on a concrete foundation or 1-course reinforced concrete; Northampton County, Route 166, Plainfield Township, 29,182 ft., 1-course reinforced concrete; Perry and Dauphin Counties, Route 195, Buffalo and North Buffalo Boroughs, and Watts and Reed Townships, 41,753 ft., bituminous surface course on a concrete foundation or 1-course reinforced concrete; Schuylkill County, Route 161, New Castle, Blythe, Ryan and West Mahoning Townships, 22,435 ft., 1-course reinforced concrete; Snyder and Juniata Counties, Routes 195 and 229, Susquehanna and Chapman Townships, 25,737 ft., bituminous surface course on a concrete foundation or 1-course reinforced concrete; Venango County, Route 91, Sugar Creek Township, 14,000 ft., 1-course reinforced concrete; Westmoreland County, Route 68, Derry Township, 32,047 ft., 1-course reinforced concrete and hillside vitrified brick.

State Aid for Rural Motor Express in New York

Reconstruction Commission Recommends the Appointment of a State Highways Transport Committee for Promoting Rural Motor Express

The Reconstruction Commission of the State of New York, in a recent report to Gov. Smith, recommended the establishment of a state highways transport committee to faciliate the marketing of foodstuffs. The report was prepared by the Commission's Committee on Food Production and Distribution with the approval of its Sub-Committee on Agriculture.

After calling attention to the possibilities in the marketing of farm products by motor truck, the report cites a number of examples of such utilization of the truck and outlines the progress already made in the State of New York. The report then summarizes the advantages of rural motor express and, in view of its possibilities "as a means of facilitating the marketing of foods and thereby encouraging production", recommends that a temporary non-salaried state highways transport committee be appointed by the Governor, the committee including the State Commissioner of Highways, a representative of the State College of Agriculture, or the County Farm Bureau organization, a representative of the State Department of Farms and Markets and "two other public spirited men interested in this subject but not connected with any concern having to do with the manufacture or sale of motor trucks." It is suggested that the regional director of the Highway Transport Committee of the Council of National Defense to be one of the latter members.

The purposes of the committee, as outlined in the report, should be as follows:

"1. To secure the cooperation of existing governmental agencies, including county farm bureau managers, municipal officials and state departments, together with organizations of farmers, food distributors and consumers, in formulating a program for the development of rural motor truck express routes in the localities of the state where they will aid most in giving the farmer a more direct outlet for his produce and in supplementing the existing transportation facilities.

"2. To coordinate the state's policy of highway construction and improvement so far as possible, with the needs of this program.

"3. To stimulate interest in the development of rural motor truck transportation, give publicity to the public utility of the rural motor express and furnish authentic information regarding the conditions under which it may be profitable and of greatest service.

"4. To recommend to the Governor any legislation or regulation that may be necessary to protect the interests of the public in the operation of motor truck express lines."

It is also suggested in the report that it would be desirable, if possible, for the commission to be granted a small appropriation to enable it to employ needed assistants.

New York-New Jersey Tunnel Organization

The New York State Bridge and Tunnel Commission and the New Jersey Interstate Bridge and Tunnel Commission, which will have charge of the building of the vehicular tunnel under the Hudson River between the Borough of Manhattan, New York City and Jersey City, N. J., have completed the organization of their field and office forces.

Clifford M. Holland, formerly of the Public Service Commission of the First District of New York, has been appointed chief engineer. There has also been appointed a board of consulting engineers consisting of J. Vipond Davies, Col. Henry W .Hodge, Col. William J. Wilgus, Maj. John A. Bensel and Prof. William H. Burr. Their salaries are to be $10,000 a year each. Edward A. Byrne, Chief Engineer of the Department of Plant and Structures of New York City, has also been appointed a consulting engineer, but without salary, because of his connection with the city.

Work on the Dixie Highway in Tennessee

Contracts Awarded for 29 Miles—Status of the Chattanooga and Nashville Section

The State Highway Department of Tennessee has recently awarded contracts for the improvement of 29 mi. of road on the Dixie Highway between Nashville and Chattanooga. The work is in Bedford, Moore and Franklin Counties.

The plans and specifications for 18 mi. of construction in Marion County have been completed and project statements filed for federal aid. It is understood that the State Highway Commission plans to use convict labor in the Marion County work which consists largely of widening the grade which has been built from Monteagle down Cumberland Mountain and the relocation of the grade over Walden's Ridge near Chattanooga.

A contract for the work in Bedford and Moore Counties has been awarded to the W. M. Smith Construction Co., of Mt. Pleasant, Tenn., while the Franklin County work has been awarded to the Solomon Construction Co., of Harriman, Tenn. It is understood that the work will be completed as soon as possible.

When the Dixie Highway between Nashville and Chattanooga is completed, according to advices from the Dixie Highway Association, it will represent an outlay of over $1,000,000. The distance between the cities is 167 mi. and 90 mi. of the route is new road which existed only on paper when the route was selected four years ago. The new road includes that crossing Cumberland Mountain and Walden's Ridge. In addition to this construction the toll gates on 40 mi. of road have been removed. Most of the grading has already been completed by the counties, and the new work consists chiefly of widening the grade, providing additional drainage, and surfacing.

◆

The Voters of the City of Chicago, Ill., will be asked to vote on a large bond issue for the improvement of certain streets at the election next fall. At a recent meeting of the City Council it was voted to submit to the people issues for the following: Widening and straightening Western Ave., $2,400,000; the extension of Ogden Ave., $5,400,000; reclaiming and improving South Water St., $3,800,000; the widening and extension of Robey St., $9,200,000, and the completion of the Michigan Boulevard Link, $2,000,000. It is proposed to meet the cost of these improvements partly by bond issues and partly by special assessments on property in the vicinity of the improvements.

MEETINGS

Calendar of Coming Meetings

Aug. 13-15.—North Carolina Good Roads Association.—Annual convention, Wrightsville, Beach, Wilmington, N. C. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

Nov. 12-14—American Society of Municipal Improvements.—Annual convention, New Orleans, La. Secretary, Charles Carroll Brown, 304 East Walnut St., Bloomington, Ill.

Feb. 9-13, 1920—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Federal Highway Council

The New York State representatives of the Federal Highway Council met in the United Engineering Societies Building, at New York, N. Y., on July 18, and organized the New York State Council of the Federal Council.

The object of forming the local council is to secure the enactment by Congress of legislation embodying the principles set forth in the Townsend Bill providing for the creation of a federal highway commission and the construction of a national highway system by the Federal Government with federal funds. In order to accomplish this object, it is planned to appoint county representatives throughout the state. These representatives will be instructed to secure the support of the Townsend Bill by local organizations through the passage of resolutions and appeals to representatives and senators. Officers were elected as follows:

Chairman, Arthur H. Blanchard, President of the American Road Builders' Association and of the National Highway Traffic Association; Vice Chairmen: D. C. Fenner, Past President of the Motor Truck Association of America; George M. Graham, Manager of the Pierce-Arrow Motor Car Co.; Capt. Frederick S. Greene, State Commissioner of Highways of New York; E. J. Mehren, Editor of "Engineering News-Record"; and Col. Theodore Roosevelt; Secretary-Treasurer, H. W. Perry, General Manager of the Trailer Manufucturers Association of America.

PERSONAL MENTION

R. T. Smith has resigned as city engineer of Waxahachie, Tex., and has moved to Temple.

A. T. Dickey, for a number of years city engineer of Galveston, Tex., has become a resident engineer for the Henry Exall Elrod Co. of Dallas.

C. H. Kendall, until recently an assistant district engineer of the U. S. Bureau of Public Roads, has been appointed office engineer of the State Highway Department of Texas, succeeding James P. Nash, whose resignation was noted in "Good Roads" for Sept. 21, 1918.

J. C. Walton has been elected mayor of Oklahoma City, Okla. Before his election, Mr. Walton, who is a member of the Mackintosh-Walton Co., consulting engineers, was commissioner of public works of that city and in that position handled several large engineering works, including extensive grade crossing elimination.

Maj. W. J. Powell has been elected county engineer of Dallas County, Texas, to succeed J. F. Witt, whose resignation was noted in "Good Roads" for July 2.

Capt. Herbert Spencer, of the 23d Engineers, A. E. F., has been discharged from the service and has returned to his position with the Standard Oil Co.

Alfred McKeel has resigned as assistant engineer of the North Dakota State Highway Commission to become highway engineer of Polk County, Iowa.

Charles S. Lemon has been transferred to the Bureau of Township Highways of the Pennsylvania State Highway Department. He was formerly a division engineer.

R. Hannah has resigned as assistant engineer of McLennan County, Tex., to become superintendent of construction for the McCall-Moore Construction Co., on work at Gonzales, Tex.

John D. Mohler has resigned as assistant city engineer of St. Joseph, Mo., to take charge of the road construction work to be done in Buchanan County, Missouri, with the proceeds of a $2,000,000 bond issue recently voted.

Capt. W. V. Buck has been appointed assistant state highway engineer of Kansas. Mr. Buck was with the 23d Engineers, and before entering the service was in charge of construction work for A. Jaicks Co., general contractors, of Kansas City, Mo.

H. R. Moffitt, formerly an assistant engineer in the Pennsylvania State Highway Department, has been appointed a division engineer to succeed Charles S. Lemon. Mr. Moffitt will have charge of the division comprising Blair, Cambria, Somerset, and Bedford Counties.

PUBLICATIONS

CONNECTICUT HIGHWAY COMMISSIONER. Annual report for the year ending Sept. 30, 1918. Cloth, 6x9 in., 89 pages and covers; inset tables; illustrated.

This report follows the usual form of the Connecticut State Highway Department reports, consisting of a general summary of the work, followed by detailed data chiefly in tabular form. It is illustrated by a number of full-page, half-tone reproductions of photographs of improved roads and of bridges.

"A NATIONAL HIGHWAY SYSTEM." Paper 6x9 in., 32 pages and cover. Published by the American Automobile Association, Washington, D. C.

This booklet is a plea for the construction of a national highway system and contains, besides a number of articles urging greater participation in road work by the Federal Government, a considerable amount of data on roads and road work. It is profusely illustrated by half-tone views of improved roads of various types in different parts of this country, and in other countries.

"GETTYSBURG FOR THE MOTORIST." By Robert Bruce. Paper, 8x11 in., 30 pages, illustrated. Published by Robert Bruce, Clinton, N. Y., and the Automobile Club of America, New York, N. Y. 50 ct.

This booklet, according to the foreword, is written from the viewpoint of the motorist traveling west along the central section of the historic Philadelphia-Pittsburgh Route (Pennsylvania division of the Lincoln Highway), the direction in which probably the largest number of tourists will approach Gettysburg." Besides a description of the approach to the town, the book contains a detailed story of the Battle of Gettysburg and much matter of interest to the automobile tourist. The booklet is printed on heavy paper of excellent quality and is profusely illustrated by halftones of views on the battlefield. There are also several maps.

GOOD ROADS

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Dust Preventives and Road Binders

By PREVOST HUBBARD

Chief, Division of Road Materials Tests and Research, United States Office of Public Roads.
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Rideout Road, Toledo, Ohio. All during 1918 this road was traversed by Army trucks being driven to the Atlantic seaboard. Macadam road resurfaced with "Tarvia-X" in 1913 and treated with "Tarvia-B" in 1916 and 1918

Total amount invested in this road for 18 years now saved every 10 months!

THIS is Wood County's heaviest traveled road. All automobiles and motor trucks in transit overland around the western end of Lake Erie from Detroit and Toledo to the East must drive over this highway. In fact, most of the overland motor traffic to the South also takes this route.

Mr. John F. Gallier, County Surveyor of Wood County, recently figured that this highway carries 2,000 tons per day for its entire length of 7.36 miles, or more than 5,330,000 ton-miles per year!

This road is a Tarviated highway, and in a very interesting article Mr. Gallier develops the fact that *every ten months* the saving in the cost of operating motor traffic over this highway, as compared with that on a well-drained clay road, *equals the total investment in the road for the past eighteen years.*

Space is too limited to give Mr. Gallier's figures in detail, but a copy of the article, which gives the history and maintenance figures of the road since 1900, will be sent to any interested road engineer or tax-payer upon request.

Briefly, the total investment in the road for 18 years, including three Tarvia treatments, is $99,367.63, or a trifle more than $13,500 per mile.

Figuring carefully and conservatively, Mr. Gallier has worked out the difference in cost of gasoline, tires and oil alone (not taking into account the saving in wear and tear on automobiles and trucks), for traffic over the Tarvia road as compared with the same traffic over a well-drained clay road. Reduced to totals, the figures are:

Total average daily cost of gasoline, tires and oil for motor traffic on clay road..................	$714.62
Total average daily cost of gasoline, tires and oil for motor traffic on Tarvia road..............	381.73
Daily difference in favor of Tarvia road..........	$332.89
Difference for 365 days..........................	$121,475.85

This means a saving of $10,122.98 per month, or $101,229.80 every 10 months, which is more than the improved road cost to build and maintain for 18 years, including interest, engineering and drainage costs!

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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NEW YORK, AUGUST 6, 1919

Number 6

Economic Utilization of Labor Saving Road Machinery*

Advantages of the Central Loading Method of Handling Material in the Construction of Cement Concrete Pavements in Delaware

By CHAS. M. UPHAM†

Machinery includes so much that I will attempt to describe but one detail in the recent progress in the construction of concrete roads.

When the first concrete roads were constructed much of the concrete mixing was done by hand. This method was supplanted by the use of stationary concrete mixers which, in turn, gave way to the modern concrete road pavers. With the stationary concrete mixer, it was necessary to deliver the material to the mixer and then haul the concrete from the mixer to its ultimate position; when the movable paver was introduced, the general method was to place the materials along the subgrade at intervals that would allow the concrete to be deposited in place with the minimum of labor in the handling of the materials. This method involved securing the material at the point of supply; hauling it to the work; storing it on the subgrade or at some other place closely available to the mixer; rehandling it by wheelbarrows or similar method into the mixer, and depositing it in its final place.

The central loading method—which is the method I will describe—cuts the labor of handling down to a minimum, and the ultimate development of the system bids fair to be the popular method of constructing concrete roads.

The central loading method necessitates a loading plant at the freight station or point of supply, a specially equipped hauling system, and a concrete mixer equipped with a small derrick or crane.

The loading plant generally consists of a crane and hopper. Material is taken from the freight cars and placed in the

TRAIN OF CONTAINERS ON WAY FROM MATERIAL STORAGE TO MIXING PLANT.

DUMPING CONCRETE MATERIALS FROM CONTAINER INTO CONCRETE MIXER.

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*Paper presented at the 16th annual convention (1919) of the American Road Builders' Association.

†Chief Engineer, Delaware State Highway Department.

elevated hopper, from which it is drawn into the specially equipped hauling cars. At the loading plant, it is advisable to carry stock piles on account of the hold-ups in freight or available supply.

The transportation cars are especially designed. The car consists of an industrial truck body, generally of 24-in. gauge, mounted with containers to hold the material. These containers are designed to hold a certain amount of both large and small aggregates. The more recent containers have a compartment for holding a certain amount of cement. In some systems, a truck carries one container, but in others, each truck is mounted with two.

The car trucks carrying the containers are made up into trains of about ten or twelve cars, each hauled either by a gasoline or steam industrial engine. This train of containers is loaded at the hopper with definite quantities of the aggregates. If a compartment is provided for the cement, that is also loaded at the plant; otherwise the cement is piled in bags in the containers and emptied at the concrete mixer.

The train is run to the concrete mixer, where the track is so located that the containers can be lifted by a derrick attached to the mixer and emptied directly into the hopper or drum of the machine. This does away with the storing and rehandling of the material at the concrete mixer.

After the material has been mixed for the required time, it is deposited on the subgrade and the work is completed in the usual manner.

The advantages of this system are many. It not only does away with the costly handling of the materials entering into the concrete, but it provides for the ready use of large units in road construction, all the materials being handled by machinery and thus providing a means for the completion of a larger amount of road in a given time, which, in turn, reduces the cost.

The loss of materials is practically negligible. The condition of the subgrade can be kept perfect at all times and for this reason a more uniform subgrade can be secured, thus eliminating, to a degree, the probability of longitudinal cracks. Because the subgrade is kept free from materials, the side forms can be brought to better grade and line.

While the first outlay for a plant of this nature is greater than that required for work under the old system, the saving in time and labor offsets the first cost. Though it seems that there is hardly room for more development in this particular method, there is still a possibility of developing the details, as well as of increasing the size of the units.

Up to the present, the hauling of the containers has been by industrial railway, but there is no reason why this could not be done by truck or why a combination of truck and industrial track could not be worked out to economical advantage.

Road Funds in Illinois

Funds Available Are Over $30,000,000, Not Including the $60,000,000 State Bond Issue

Funds at present available for road work in Illinois amount to about $30,500,000, exclusive of the funds to come from the $60,000,000 bond issue, according to recent advices.

This sum comprises about $15,500,000 from automobile license receipts, federal aid amounting to about $12,000,000 and about $3,000,000 of bond issues voted by various counties. It is said that it will be unnecessary to use any of the funds from the state bond issue for the next two years, even if the maximum program is adopted.

Contracts for 400 mi. of federal aid work and for 100 mi. of state aid work have already been awarded, and it is expected that contracts for at least 200 mi. more of federal aid road will be let within the next 30 days.

Large Volume of Work in Pennsylvania

State Highway Department Summarizes Road Contracts Advertised and Awarded to Date

State Highway Commissioner Sadler, of Pennsylvania, has recently issued a summary of the State Highway Department's activities during the past six months.

The total mileage of projects advertised, including those covered by bids received on Aug. 5, is 601. This mileage includes 513.02 mi. of primary highway in townships and 28.17 mi. of road on the secondary highway system.

A total of 470.45 mi. of road has been awarded at a cost of $16,749,235.34. This includes 452.25 mi. of road on the primary system at a cost of $16,020,924.70.

Pavement types included in the work already awarded are summarized as follows: Reinforced concrete, 376.08 mi., $13,411,237.81; bituminous concrete, 63.38 mi., $2,750,437.71; vitrified brick, 5.7 mi., $320,177.42; bituminous resurfacing, 24.07 mi., $228,841.80; plain concrete, 1.25 mi., $38,540.60.

"Half-Width" Improvement Not Feasible in Pennsylvania Highway Work

Highway Department Explains Why the Suggested Plan Is Not Practicable

Since the Pennsylvania State Highway Department started its extensive program of road improvement, it has often been asked why it isn't possible to carry on improvement over half the width of a road so that the other half can be used during construction. In reply to this the Department has recently issued the following statement:

"The half-section plan of construction is impracticable and not economical in Pennsylvania, in the building of modern type pavements, because of the general narrowness of Pennsylvania thoroughfares. Roads so constructed would not give satisfaction, inasmuch as it would not be possible to avoid variable conditions in the construction of the two sides.

"Contractors will bid much higher on this type of construction, because they would have to cover the length of the road twice, instead of once. Materials can only be stored in one half the road.

"Especially where the road is dusty there is a marked disadvantage in using a half-width section, because the materials become dirty, not only from the dust, but from dirt thrown up by traffic.

"The congested right of way—that is, the small width from fence line to fence line—as well as the width necessary for heavy grading on most Pennsylvania roads, mitigate against half-way construction. Contractors would be handicapped through traffic tying up grading operations. And Pennsylvania roads carry more bridges which would have to be rebuilt than do most other states.

"Most of the construction on the state's primary system cannot be classed as resurfacing. In discussing the half-width idea, the only economical and reasonable way, so far as the state is concerned—and most certainly the contractor—is to eliminate traffic from the section being reconstructed. Both time and money are saved. Any other course would be poor housekeeping."

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The Board of Supervisors of Chautauqua County, New York, has approved plans for the construction of the uncompleted portions of the road around Chautauqua Lake. These sections are on the west side of the lake, between Jamestown and Mayville. The distance around the lake is about 45 mi.

Highways Transport Committee for New York

Text of the Reconstruction Commission's Report Recommending the Establishment of a State Highways Transport Committee to Promote the Marketing of Farm Produce by Rural Motor Express

The possibilities of improving the facilities for marketing of farm products in this state through the establishment of rural motor truck express routes are at this time worthy of particular attention on the part of the government of New York State. It is the opinion of the Reconstruction Commission that the encouragement and aid of the rural motor truck express movement is in a measure a public duty and will result in a distinct benefit to the farmer and to the city consumer.

The farmer cannot profitably produce perishable foodstuffs unless he can get them promptly to market. The owner of a large truck farm or poultry farm near a city may be able to afford to purchase and operate one or more motor trucks of his own to get his produce to market, even though the truck is used only a few months of the year. The small farmer, however, has to go to an expense of time and labor to get his foodstuffs to market, that in many instances takes away the profit from the sale. By a lack of easy and reliable means of sending small quantities of produce to market, he is discouraged from producing anything that he cannot sell in large quantities and from attempting to market the surplus of perishable produce he may have above his own needs. His attention must be given to his fields, if he is to secure a production that will pay.

Exigencies of the war, together with the bad weather of the winter of 1917-1918, placed such a strain upon the railroads, resulting in congestion, delay and embargoes, that shippers all over the country turned to the use of motor trucks. Motor truck routes between industrial centers and shipping points grew up all over the United States in a comparatively few months; but of much more significance was the general interest taken throughout the country in the development of motor truck routes from rural sections to cities for the purpose of bringing foodstuffs to the consuming centers more directly and cheaply.

The food supplies of the large consuming centers have been brought to market chiefly by the railroads. It was only when the railroads failed to carry all the food necessary that it became generally recognized that the whole system of depending upon railroad transportation to get food supplies from the country to the city neglected the large percentage of farmers who are miles away from railroad shipping points.

Usefulness of Rural Motor Truck Express Demonstrated During the War

So many demonstrations have been made of the usefulness and economy of rural motor truck express since the beginning of the war that the State of New York can safely lend its encouragement and aid to this movement, without doubt as to the ultimate benefits that will result both to the producer and consumer. In March, 1918, the Post Office made an experiment. At six o'clock one morning they loaded a motor truck at Lancaster, Pa., with 18,000 eggs in crates and 1,000 day-old chicks, and started it off for New York City, 180 mi. away. At the same time, they sent the same kind of shipment to the same consignee by train.

The truck arrived in New York only twelve hours after it left Lancaster. Four of the chicks were dead and nine eggs were broken when the goods were delivered at the consignee's door. The train shipment was four days in reaching Jersey City. Another day was lost sending a notice to the consignee that it had arrived. He was then obliged to send his own truck over for the shipment. And when it finally reached his door, thousands of eggs had been smashed. Half the chicks were dead.

The shipping of potatoes between two towns in Iowa also illustrates the economy of the motor truck express. The farmers around St. Ansgar, Iowa, (see article by F. W. Fenn in "American Magazine" for March, 1919, entitled "Here is News—and Maybe Some Money in Your Pocket.") raised potatoes which they sold for 90 ct. a bushel to buyers who shipped them by rail to the large cities, where many of them were reshipped to other points. At Mason City, only 25 mi. from St. Ansgar but not on the same railroad, people were paying $1.75 a bushel for potatoes, which were shipped there from 300 mi. away. A rural motor express line was started in Mason City. Among other things, it brought in potatoes from the St. Ansgar farms, paying the farmers $1.00 a bushel for them, instead of 90 ct., and selling them to the Mason City consumers for about $1.25 instead of $1.75 a bushel.

A rural motor express running from Deadwood, S. D., to Sundance, Wyo., covers the distance in six hours. A shipment via railroad between these two points is billed four separate times and takes from three to five days. The express charges and rail charges are the same.

More than 600 motor express lines are already in successful operation. There are 150 in California alone. The entire state of Iowa has been divided into districts, each district has been mapped out in motor truck routes, and dozens of lines are running and making money for themselves besides serving the farmers, the little villages and the central cities. (Quoted from an article by F. W. Fenn, 1919.)

If it were not for the motor truck line, the farmer would have to drop his own job, hitch up a horse or take his own automobile and go to town himself. He would lose at least half a day from his work. It would cost him about 1 ct. a mile for gasoline, if he has a car, besides the wear and tear on the machine; or it would take the horse from farm work. Farmers who are served by the motor truck lines declare that these lines enable them to dispense with one horse and one man in their work.

Produce shipped by rail is reshipped, loaded and unloaded several times, and all this cost is added to what the consumer has to pay.

The farmers of upstate New York complain that they have suffered a great deal in getting small shipments to market because the railroads were not interested in the local freight business. The express freights for perishables which used to give the New York State farmer a chance to get his perishable products quickly into the New York City market, have been discontinued by the railroads. The New York farmer now finds that it takes longer for his produce to get to New York City by freight than it does for lettuce and vegetables from Florida, which have the advantages of fast freight transportation. He might as well, in most cases, throw his fruit or vegetables away as to try to ship them to New York markets unless he can send them in very large quantities.

The local motor truck lines will take one milk can or a dozen, one bushel of apples, one crate of berries or of eggs or of chickens, a pound of rails or a piano. And they will deliver these good promptly. For example: A Maryland farmer had been feeding his cream to the pigs because he did not have enough to ship by the railroad and couldn't afford to haul it to town himself. A truck line was started that passed near his farm, and he immediately sent his cream to market at a good price. He was the gainer, and so were the people in town, who wanted that cream. The pigs were fattened on a less expensive diet. Twenty-two of these lines are now operating in Maryland; 15 out of Baltimore alone. Thirty trucks cover a total of 1,574 mi. a day on these routes. Some of them run in and out of Washington; and it is said that, but for these trucks, there would have been an absolute milk famine in that city. The Baltimore trucks carry a hundred tons of food into town every day, and hundreds of patrons along the routes were served regularly all last winter regardless of weather conditions.

In ten months, motor trucks carried from Council Bluffs to Omaha, 18,498 head of cattle, 158,019 head of hogs, 37,130 sheep. In six months they carried over this route the equivalent of 1,300 carloads of hogs. And it must be remembered that these were carried direct from the shipper to the buyer. If they had gone by train, the shipper would have had to haul them to the cars and the buyer would have had to haul them away. The saving is evident. Not only that, but the livestock arrives in far better condition when sent by the trucks.

Cooperative Operation of Truck Routes

In practically every section where trucks are used as a means of transportation between city and country, they are operated either by individual farmers and rural merchants to meet their own needs or by private individuals for profit. An interesting exception, however, is the motor truck route operated by the "Farmers' Cooperative Company of Harford County, Incorporated," of Harford County, Maryland. A recent bulletin of the United States Department of Agriculture states that this association appears to have met the needs of the rural community it is serving in a very satisfactory manner, and at the same time has eliminated effectively the problems of profit and destructive competition.

The section in which this cooperative association operates has but one railroad. Many of the farmers produce milk which is shipped to Baltimore; some raise crops, and the remainder practice general farming. When a privately owned motor truck route raised the rates to more than the farmers could pay, they decided to organize an association and operate trucks of their own at actual cost. Now, this association is not only transporting the farmer's produce to town for him and bringing his supplies out, more efficiently and at lower rates than the private truck ever did, but it has become a wholesale purchasing and marketing agency. It is now operating two 4-ton trucks which cover about 60 mi. daily.

The experience of this association would seem to indicate that the most constructive and permanently beneficial results in the operation of motor truck routes will be secured through ownership by cooperative associations.

Progress of the Movement in New York State

Some start has been made in the rural motor express movement in New York State. A motor truck route was started from Gilderland, N. Y., to Albany three years ago, and began hauling things from the farmers to the town, and from the town to the farmers. Last year it delivered 1,022,000 qt. of milk at Albany. A rural motor express is operating between Poughkeepsie and New York City, a distance of 80 mi., carrying farm produce and fruits and returning with freight.

A rural motor truck express operating from Buffalo to Springville, N. Y., a distance of 30 mi., has carried farmers' produce in and farmers' needs out.

The Long Island Rural Express Co. is operating four trucks from New York City to Patchogue daily, a distance of about 50 mi. It carries fruits, groceries and miscellaneous freight to the Long Island merchants and brings to New York, fish, eggs, vegetables and poultry. This line began with one truck about six months ago.

New York State, which is particularly endowed with railroads and commercial waterways nevertheless, has many areas which are not tapped by either of these two transportation agencies and which are in need of some transportation connection with the railroads or waterways. The population of New York State has increased tremendously in some sections, particularly in the large cities, in recent years. It has at the same time decreased in the rural districts in most counties. This shifting of population has brought new transportation needs. Railroads are fixed to the soil and cannot shift to meet changed conditions. Hence many branch roads no longer adequately serve the needs of transportation. A rural motor express system should be inaugurated in such sections. In other cases, rural motor routes are needed to connect up branch lines of railroads, or to extend the transportation service farther back into the hills, beyond the ends of the branch railway lines.

A country village enjoying a farmers' trade within a radius of 5 mi. could in many cases increase this radius to 7 mi. by establishing a farmers' market and a system of rural motor express. By thus extending the trade area by 2 mi. in each direction, the area served would be doubled.

Freight flows along railway lines to big terminals. This frequently leaves a scarcity in certain localities tributary to the railroad (as hay in 1919 in northeastern New York) with a supply in nearby sections of the railroads. Transportation in such cases can be furnished by the railroads only by an expensive back-haul from the terminal. However, a rural motor express service would meet such a transportation need in an economical manner.

In reply to questionnaires sent out to a few of the leading farmers of the state, the Committee on Food Production and distribution of this Commission received a most hearty endorsement of the rural motor truck express idea. These few questionnaires suggested the need for motor express routes in almost every county of the state, particularly emphasizing the need in Wyoming County, Allegheny County, Albany and Rennselaer Counties. The fruit and vegetable regions such as the counties of Delaware, Sullivan, Dutchess, Putnam and the southern tier counties, would seem to be a fertile field for the development of the rural express routes.

Hundreds of motor trucks come into New York City daily from New Jersey and Long Island carrying farm products. Most of these trucks, however, carry only the produce of a single farm, and often come in underloaded, returning empty. Such operation is very expensive and might be remedied by cooperation through the guidance of some state or interstate agency.

Good Roads Essential

New York State is better equipped than most other states for the development of this movement, inasmuch as it has 18,400 mi. of surfaced roads, and 79,398 mi. of rural roads, or 23% of surfaced roads, a much higher percentage than the average for the United States.

The success of motor truck express depends to a very large degree on the character of the roads over which the routes run. Bad roads increase the operating costs, and consequently the rates to patrons, beyond the point of economy. Trucks are destructive to roads unless the roads are permanently built. Therefore, the problem of improving and developing the marketing facilities for the farmers of New York State through the establishment of rural motor express lines is directly connected with the problem of permanent improvement of the highways of the state. Inasmuch as this state received in 1919 from auto fees alone almost $5,000,000, it would seem that a far reaching road improvement policy could be pursued without additional taxation.

Federal Government Endorsement

As a result of the investigations made by the Highways Transport Committee of the Council of National Defense, Federal Food Administrator Hoover gave his enthusiastic support to the movement for developing rural motor truck expresses as a means of saving perishable foodstuffs, encouraging production of food, lowering cost of living and conserving man power on farms. He has made the astonishing statement that 50% of the perishables produced in America are wasted, largely through insufficient methods of transportation.

The Post Office Department has aided the movement not only by conducting experiments such as that described above, but by placing motor truck express routes in permanent operation in various parts of the country, their financial success being guaranteed by the fact that they carry mail between the termini. The Post Office Department has certain plans for using for this purpose the trucks no longer needed by the Army Department. The movement has also received the official endorsement of the Secretary of Commrce, who has stated that the utilization of highways for motor truck routes is as important as the utilization of railroads and waterways to the completion of an adequate transportation system.

The United States Railroad Administration has taken a favorable attitude toward motor truck transportation, especially in relation to short hauls.

Cost Compared with Wagon Hauling

The cost of purchasing a motor truck may vary from $800 for the lightest type to $6,000 or more for those of 5 or 10 tons capacity. The cost of operation depends on many factors, among the most important of which are: The type of truck selected, the character of the roads, volume of business, reliability of driver, type of service rendered and length of route covered. No two routes are enough alike to warrant placing much value on statements as to average cost, at least until something approaching a standardized cost system has been generally established by the lines now in operation. It is of interest, however, that a concern operating a large number of high grade 5-ton trucks has found that counting all charges, including oil, gas, tires, repairs, depreciation, interest, insurance and one chauffeur at $5.00 a day, the total cost of operation is $29 a day for a 50-mi. run, with an additional charge of 25 ct. a mile for each mile over the 50-mi. run within the time when no extra pay is given the chauffeur, and a deduction of 25 ct. a mile for each mile under 50 mi. under similar conditions. These data are based on a run with fairly good roads between cities and towns.

At this cost rate the truck could afford to carry potatoes, say 25 mi. from country to city, at about 9 ct. per bushel, picking them up at the farm and delivering them at the city receiver's door. The railroad rate for the same distance would be about 15 ct. and the farmer would have to bring them to the railroad and the receiver haul them away at the other end.

A comparison of the cost of motor truck hauling and hauling by horse-drawn wagon is given in the October, 1917, issue of the "Monthly Crop Report" of the United States Department of Agriculture. This report states that tests between wagon and motor hauls from farms to shipping points shows results much in favor of the motor haul. In one of these tests the motor truck which traveled a 25% longer distance made 183% more round trips, carried 48% more corn, 50% more wheat and 83% more cotton. This work was done at 45, 50 and 37% of the ton-mile cost of wagon hauled corn, wheat and cotton respectively.

Summary of Advantages of Rural Motor Express

The most important advantages to be gained by wide extension of rural motor express routes may be summarized as follows:

1. Giving a market outlet to food supplies hitherto unavailable because of the distance between producer and the market and lack of transportation.
2. Transportation of produce to the consumer more quickly and in better condition than is possible under present methods.
3. Maintaining of men and horses on the farms who now spend a great part of their time driving to market.
4. Elimination of unnecessary handling and special packing of produce involved in shipping by rail.
5. Establishment of more direct connections between farmer and market.
6. Encouragement of diversity in farming, as a result of widening the marketing areas.
7. Substituting for the disinterested impersonality and limited liability of railroad shipping on short hauls, an agency that personally collects and delivers produce, performing marketing as well as transportation functions.
8. Serving as a feeder to the railroads and water transportation lines.

Public State Policy Toward Development of Rural Express Proposed

In view of the great possibilities of motor truck transportation as a means of facilitating the marketing of food and thereby encouraging its production, the Committee on Food Production and Distribution, with the approval of its sub-Committee on Agriculture, recommends to the Commission that it favor a constructive public state policy toward the development of rural motor express routes in this state. In the opinion of this Committee it is not sufficient merely to leave this matter of such great public importance to the people of this state to chance development by scattered individuals who may be induced to purchase trucks. The State Food Commission, during the war, went so far as to purchase a large number of farm tractors and operate them in different parts of the state as a means not only of immediately increasing production and saving man power, but of demonstrating to the farmers of the state the value of the tractor in order that those who were able to, might be led to purchase them for their own private use. It is not advocated that the state purchase motor trucks or operate motor truck lines but it is advocated that the state do everything within its power to stimulate the development of motor truck routes that will serve rural communities. The function of the state in this connection is largely educational. In the advancement of any new enterprise of a public service character the interests of the public should not wait upon the private interest or initiative of individuals.

Recommendations

As an agency for the promotion and direction of the movement for rural motor express lines in New York State, the Committee on Food Production and Distribution, therefore, recommends that a temporary non-salaried state highways transport committee be appointed by the Governor, which commission shall include the state commissioner of highways, a representative of the State College of Agriculture or the County Farm Bureau Organization, a representative of the State Department of Farms and Markets and two other public spirited men interested in this subject but not connected with any concern having to do with the manufacture or sale of motor trucks. (It is suggested that one of these be the regional director of the Highways Transport Committee of the Council of National Defense.)

The purpose of this commission should be as follows:

1. To secure the cooperation of existing governmental agencies, including county farm bureau manager, municipal officials and state departments, together with organizations of farmers, food distributors and consumers, in formulating a program for the development of rural motor truck express routes in the localities of the state where they will aid most in giving the farmer a more direct outlet for his produce and in supplementing the existing transportation facilities.

2. To coordinate the state's policy of highway construction and improvement, as far as possible, with the needs of this program.

3. To stimulate interest in the development of rural motor truck transportation, give publicity to the public utility of the rural motor express and furnish authentic information regarding the conditions under which it may be profitable and of greatest service.

4. To recommend to the Governor any legislation or regulation that may be necessary to protect the interests of the public in the operation of motor truck express lines.

It would be desirable, if possible, for such a commission to have a small appropriation to enable it to employ a small staff of employees. Lack of an appropriation, however, should not prevent it from accomplishing the purposes outlined, as the three state departments represented could, by the Governor, be directed to provide the necessary clerical help, while field investigations could be conducted through existing agencies.

Road Bills Introduced in Congress

Brief Synopses of Some of the Important Measures at Present Under Consideration

As noted in "Good Roads" for July 9, more than forty bills proposing federal expenditures for road work and federal supervision have been introduced at the present session of the Congress. Besides those mentioned in the July 9th issue, there has been introduced by Senator Ransdell, of Louisiana, a bill that if adopted would have far-reaching effects upon federal aid road work.

This measure, designated as S. 1376, creates an Auxiliary Engineer Corps of the United States Army to control public works of various kinds, including the supervision and construction of national highways and bridges. The corps is to be a separate and distinct national organization with a military status and under the command of the Chief of Engineers.

Under the provisions of the bill, the Chief of Engineers must divide the country into engineering districts and divisions and place them in direct charge of division engineers.

Each district organization is divided into six sections as follows: (1) Administrative; (2) engineering; (3) finance; (4) procurements; (5) construction; (6) guarding.

A bill introduced by Senator Jones, of Washington, to which reference was made in the former article, is designated as S. 2232, and provides for the creation of a department of public works to take over the work of certain departments and bureaus. According to an abstract furnished by the Highway Industries Association, some of its main provisions are as follows:

"This bill calls for the creation of a Department of Public Works and defines its powers and duties. It provides that the name of the executive department now designated as 'Department of the Interior' shall be changed to the 'Department of Public Works,' and that the head thereof shall continue to be a member of the Cabinet under the official designation 'Secretary of Public Works,' to be chosen and confirmed by the law covering the selection and appointment of secretaries, as now provided.

"Section 2 provides that all powers, functions and duties, executive and administrative, personnel and property, and all bureaus and other instrumentalities now vested in a part of the Department of the Interior be, in a like manner and to the same extent, continued in the Department of Public Works, and that the following bureaus and other instrumentalities shall be included and form a part of the Department of Public Works:

"(1) The Supervising Architect's Office.

"(2) The Construction Division of the United States Army, River and Harbor Improvements, the Mississippi River Commission and the California Debris Commission.

"(3) The Coast and Geodetic Survey and the Bureau of Standards.

"(4) The Bureau of Public Roads and the Forest Service.

"It takes from the Department of the Interior and transfers to other departments the Patent Office, the Bureau of Pensions, the Bureau of Education, the Bureau of Indian Affairs, St. Elizabeth's Hospital, and other hospitals and institutions of like nature.

"It provides for the continuation of all of the personnel of the present divisions to be inducted into the Department of Public Works, and provides that there shall be four assistant secretaries of public works, appointed by the President, by and with the advice and consent of the Senate, each qualified by training and experience for the particular service over which he may have jurisdiction. The assistant secretaries are to be paid $7,500 per annum. One assistant secretary is to have administrative jurisdiction over all matters of engineering, design and construction by whatever bureau or instrumentality of the department performed. One assistant secretary is to have administrative jurisdiction over all architectural design and construction by whatever bureau performed. One assistant secretary is to have administrative jurisdiction over all scientific work and surveys, by whatever bureau perfomed; and one assistant secretary is to have administrative jurisdiction over all land and legal matters. It is also provided that the four assistant secretaries shall, under the direction of the Secretary of Public Works, coordinate and bring into efficient relation all of the functions included in this section, to the end that the work of the department shall be harmoniously and most economically performed."

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The Conesus-Wayland, or Springwater, Road in Livingston County, New York, is to be improved by the construction of a half-width pavement of cement concrete, according to recent advices. Over five years ago the county supervisors awarded a contract for the construction of a macadam road, 16 to 18 ft. wide, for about $120,000. The work had been started when the war put a stop to operations. The State Highway Department has now refused to approve construction according to the old plans and specifications, and plans to build a cement concrete road, 8 or 9 ft. wide, or half the width formerly proposed, at an increased cost of something over $100,000, with a view to building the other half at a later date. This method is in line with the policy outlined by Commissioner Greene in an address before the Jamestown Automobile Club, which was reported in "Good Roads" for June 14.

GOOD ROADS

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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GOVERNMENT REGULATION OF THE RATES CHARGED BY MOTOR TRUCK EXPRESS LINES

The action of the State Railways Commission of Nebraska in undertaking the regulation of rates charged by motor truck express lines, note of which is made elsewhere in this issue, can hardly fail to interest operators of such lines in other states, for it foreshadows similar action in other sections.

The remarkable growth of the business of hauling commodities over the highways by motor trucks and trailers is beginning to be appreciated by the general public as well as by those whose work brings them into contact with highway transportation. It is probably only a matter of time until shipping by motor truck will be an every-day affair, attracting no more notice than does shipping by freight, express or parcel post. Naturally, when the business has developed to that extent, there will be strong competition in certain localities, with the usual accompaniment of ruinous rate cutting, while in other places operators enjoying a temporary monopoly will take advantage of their opportunities and charge exorbitant rates. These conditions must lead inevitably to the fixing of rates and to other regulation.

Moreover, since much of the business of highway transportation is, and will be, interstate business, it is to be expected that the establishment of rates and the formulation of regulations will devolve upon the Interstate Commerce Commission or some other federal agency having like powers and responsibility.

The fixing of rates is going to be no light task. If the public is to be served well at a reasonable cost—and that is the real function of highway transportation—it will be necessary to make the rates such that they will cover the cost of operation and give the operators a fair profit. It is evident, therefore, that the problem is one into which there enters an almost overwhelming number of variables. The equipment used, labor costs, character of commodities hauled and—above all, perhaps—the condition of the roads traversed are a few of them.

At present there is too little information available upon which to base intelligent regulations. Extensive investigations and thorough, painstaking study are needed, and road builders and road users will have to exert their best efforts in the work if they are to obtain equitable rates and reasonable regulations.

TO PROMOTE RURAL MOTOR EXPRESS IN NEW YORK STATE

In the issue of July 30 note was made of the action of the Reconstruction Commission of the State of New York in recommending to Governor Smith the establishment of a state highways transport committee to facilitate the marketing of foodstuffs. In this issue the full text of the report is printed.

It is to be hoped that the commission's recommendation is the first step in an undertaking that will work out to the advantage of both the producer and the consumer, for it is certain that such results would follow the proper development of motor truck hauling in the state. Under existing conditions, farm produce is inordinately high in the cities, while it is generaly admitted that a very considerable portion of the produce that might be brought to the city markets—thus lowering prices—is wasted because of the lack of transportation facilities. Of course, this situation is wrong and a reflection on the state's machinery for distribution, but it seems to be so generally accepted as a matter of course as to cause relatively little criticism.

As pointed out in the report, the efficiency and economy of rural motor express in marketing farm produce have been demonstrated in many sections of the country. There is no real reason why motor truck lines should not accomplish a great deal in New York State, for there are many highly productive sections within practicable hauling distances of good city markets. In addition, the state is well supplied with roads, many of them in excellent condition, and practically all of them of such character that, at a not too great expense, they could be made to serve the purpose.

Among the examples of the efficacy of the rural motor express cited in the commission's report, is that of the cooperative company formed by farmers of Harford County, Maryland. This organization, which was described in some detail in "Good Roads" for April 12, is a corporation operated by the farmers in a section near Baltimore. It carries their milk and farm produce to the city and brings back supplies of all kinds. It has been eminently successful; and this success naturally suggests the possibility of similar undertakings in New York.

While cooperative hauling by the farmers themselves offers one solution of the problem of marketing the produce of New York State farms, it is by no means the only one, nor, perhaps, the most feasible. There are already many individuals and companies operating rural motor express lines in the state and carrying large amounts of food from farms and truck gardens to the city markets. Their number can easily be increased by giving operators the right kind of assistance and protection.

A state highways transport committee composed of the right men, clothed with adequate authority and provided with suficient funds to carry on its activities could plan a great work in the State of New York. And with the cooperation of the Department of Highways and other branches of the state government, it could carry out the work it had planned.

HIGHWAY TRANSPORTATION

Motor Vehicle Fees in Massachusetts

Bill Fixing Registration Fees for Motor Vehicles Is Signed by Governor Coolidge

The bill fixing the registration fees for motor trucks and trailers in Massachusetts has been signed by Governor Coolidge and will become effective Oct. 9, 1919. The fees are based on carrying capacity, according to the following schedule:

Capacity of 1 ton or less	$10
Capacity of 2 tons and over 1 ton	20
Capacity of 3 tons and over 2 tons	30
Capacity of 4 tons and over 3 tons	40
Capacity of 5 tons and over 4 tons	50

For capacities of over 5 tons, the fee is fixed at $50 for the first 5 tons and $10 for each additional ton or fraction of a ton.

Fees for commercial trailers equipped with non-resilient metal tires are twice the fees for trucks, and for commercial trailers equipped with pneumatic or resilient metal tires they are one-half the truck fees. One-half the truck fees are also levied upon all electric motor trucks and electric motor vehicles used solely for commercial purposes. The term "trailer" is defined as not including a pair of wheels used as an implement for other purposes than transportation.

Successful Texas Truck Line

Empire Transfer & Storage Co. Operates Over 35-Mile Route on Regular Schedule

One of the many intercity motor express routes that have been established in recent years operates on a regular schedule between the Cities of Dallas and Fort Worth, Texas. Freight of all kinds—"from chocolate drops to heavy hardware," as the operator describes it—is carried, and in less time and at lower rates than by railroad.

The line is operated by the Empire Transfer & Storage Co., the equipment consisting of a 4-ton Acme truck and a 3-ton trailer. An ordinary load consists of 12,000 lbs. on the truck and from 5,000 to 6,000 lbs. on the trailer. The illustration shows the outfit on Chalk Hill on the Dallas-Fort Worth Pike. The distance between the two cities is 35 mi. According to F. I. Tobias, of the operating company, the line has all the business it can handle, and at the time the statement was made (early in May) the truck was being operated day and night, two shifts of drivers and helpers being employed.

The line has been in operation since last fall. During that time the expenditures for spare parts and repairs have amounted to $40. On the round trip, the gasoline consumption is about 20 gal.—an average of 3.5 mi. per gallon for the truck and trailer.

New Autocar on 4,000-Mile Test Run

Two Trucks Making Transcontinental Test Trip from Ardmore, Pa., to San Francisco

A new 3½-ton Autocar, built by the Autocar Company of Ardmore, Pa., has been started on a transcontinental test run over practically the same route as that taken by the truck convoy of the Motor Transport Corps.

The trip is also being made by one of the company's standard 1½ to 2-ton, 120-in. wheel-base trucks. The machines left Ardmore on July 14 for Washington, going from that city to Chambersburg and then to the Lincoln Highway. Passing through Pittsburgh, the cars will continue over the Lincoln Highway to Cheyenne, Wyo. From Cheyenne, the trucks will make a detour to Denver, Colo., and Pike's Peak, which both cars will ascend. They will then return to Cheyenne and continue over the Lincoln Highway to San Francisco. The various Autocar branches in California will be visited and the run will be finished at Los Angeles.

The run is entirely for the purpose of testing, and both trucks will be loaded to capacity all of the time. The 3½-ton truck has already covered 22,000 mi. It is a 4-cylinder machine of 25.6 hp., S. A. E. rating. It is a new model, and machines will not be available for distribution before the first of the year, it is stated.

A. B. Cumner, of Washington, D. C., F. J. Gardener, of Baltimore, Md., and A. K. Brumbaugh and George Hay, of Ardmore, engineers of the Autocar Company, will accompany the trucks on the entire trip.

ACME TRUCK USED WITH TRAILER BETWEEN DALLAS AND FORT WORTH, TEXAS.

NEW 3½-TON AUTOCAR NOW ON TRANSCONTINENTAL TEST RUN.

Truck Express Rates Fixed in Nebraska

State Railway Commission Establishes Rates for Motor Truck Express Routes

The establishment of standard rates for motor truck hauling in eastern Nebraska has been undertaken by the Nebraska State Railway Commission, according to the National Automobile Chamber of Commerce.

The rates were established after a study of operating costs and are intended to cover those costs and give a fair margin of profit. The estimates of operating costs used by the commission are as follows:

	Ct. Per Ton-Mile.
Operating:	
Gas and oil	2.500
Chauffeur's wages	7.200
Maintenance:	
Running repairs	2.500
Depreciation	4.160
Repair of tires, etc	1.870
General:	
Salaries, rent, etc	3.000
Insurance	0.500
Loss and damage	0.800
Taxes	0.027
Return on investment	2.500
Total	25.057

The figures are based on one truck with a 4,000-lb. load, driven 50 mi. daily. Gasoline is figured at 25 ct. per gallon and oil at 75 ct. The chauffeur's wages are estimated at $24 weekly, with a daily expense allowance of $2. Depreciation was fixed on a scale of 3,600 mi. and tires were given a life of 7,500 mi. Taxes were figured at $1,200 per ton for the first year of the truck's life, $800 per ton for the second year and $400 per ton for the third year. The returns on the investment were figured at a rate of 20%.

The rates fixed are described by the National Automobile Chamber of Commerce as follows:

"The rates provide for a motor truck schedule within a radius of 60 mi. Four classifications are provided for in these rates between points not within the same city or village in eastern Nebraska. The minimum charge for first class commodities is 15 ct. per 100 lb., in addition to which a charge of 1.5 ct. is made for each mile. Second class rates are 85% of this figure, third class rates are 70% and fourth class rates are 60%. The minimum charge is 50 ct."

The Future of the Trailer

Highway Transportation Company Manager Suggests That Farmers Load Their Own Trailers and Leave at Road for Pick-Up

In a letter to the Trailer Manufacturers' Association of America, C. T. Boyd, Manager of the Highway Transportation Co., of Los Angeles, Cal., suggests a somewhat novel expedient by which farmers and small shippers may solve their transportation problems. By the plan proposed, the shipper would load his own trailer and leave it at the roadside to be picked up by the truck of the transportation company.

He cites the obstacles in the way of such plan—prejudice against trailers and excessive license fees—but believes in the practicability of that method of shipping.

"This company's efforts to popularize the use of privately owned trailers for the shipment of goods between points on its routes and beyond," he says, "lacks the sympathy of both the insurance companies and the public officials, and yet we can see no valid reason why a shipper owning a trailer, and who cannot afford a truck, should be deterred from shipping his commodities in that manner. He is relieved of the responsibility of transportation; effects a saving in original investment; and is able to devote time to other work, having only the loading and unloading of the shipment to handle. In any finality, a wider distribution of trailers and trucks and the breaking down of such prejudices and repeal of such laws as are inimical to their fullest operation and use are absolutely necessary."

Trucks Deliver Bread in New England

Bakery in Springfield, Mass., Employs Fleet to Carry Loaves to Customers in Massachusetts and Connecticut Cities

One of the most important phases of the development of motor truck transportation is the installation by large shippers of their own truck fleets to deliver their products to customers. A striking instance of this is furnished by Dexter's Bakery, of Springfield, Mass., which now uses a fleet of seven 5-ton Pierce-Arrow machines to deliver bread to cities in Massachusetts and Connecticut.

The bakery installed the first truck in 1913, and since then, it is stated, delivery failures have been almost unknown. This is in sharp contrast with the company's experience previously, when express shipments were made by rail, and lost and delayed shipments were frequent.

Five of the trucks purchased during the past two years are used exclusively for delivering bread to retailers in various cities, including Athol and Pittsfield, Mass., and Waterbury, Bristol, Hartford and Rockville, Conn. From 60,000 to 70,000 loaves are distributed nightly, with a regularity said not to be obtainable by any other form of transportation. The other two machines are used to deliver in Springfield and to haul to the bakery supplies of flour, eggs, butter, salt, sugar and the like.

The performance of the unit employed for Waterbury deliveries may be cited as typical. The truck was put into service in May, 1918, and has made six trips weekly since that date. The round trip is 130 mi., and during the first year the truck traveled practically 50,000 mi. It is stated that the valves were ground once, carbon was removed once and brake linings were replaced as required. No other repairs or replacements were made.

While the bakery company emphasizes the benefits of prompt, regular and certain deliveries, there is also a marked reduction in transportation charges. In the first place, the actual hauling cost is about 50% of the cost by rail express. In the second place, shipping by truck makes possible the substitution of pasteboard cartons for wooden containers. As the cost of sending the containers back to the bakery amounts to from $10 to $12 for each 200, the saving amounts to several thousands of dollars yearly.

Army Truck Convoy Will Aid Roads

Transcontinental Trip of Military Truck Train Will Greatly Benefit the Movement for Good Roads Windsor T. White Believes

"Much good will come to the movement for national highways through the Army Motor Truck Tour now being made across the country by two units of the Motor Corps," said Windsor T. White, Vice President of the Commercial Vehicle Division of the National Automobile Chamber of Commerce, recently.

"A few years ago the effort of a single passenger car to cross this continent was considered extraordinary. During the war the need of an effective agency of transportation to supplement railroads called particular attention to the fact that better highways are necessary from a military as well as commercial standpoint.

"The present trip of the army men across the continent will furnish us with a valuable set of information regarding road conditions and operating costs and other factors which enter into highway transportation, including the need of trained corps of operators.

"How important a factor the truck is in modern usage was indicated by Secretary of War Baker in his speech made in Washington on the morning of the departure of the convoy for San Francisco.

"After reviewing the vital part which the motor truck had played in the war, turning it from a question of static conflict to one of motion at one of the most critical moments, Secretary Baker passed on to a discussion of our highway needs in this country as a means for permitting the efficient operation of highways transportation.

"These needs will be clearly brought out not only from a military but from a commercial standpoint by the present tour, which, while it is traveling over the best trans-continental roads we now have, will still follow many stretches of slow and tedious if not dangerous going.

"Out of this will come strongly crystallized sentiment for a national highway system as one of the things necessary to the welfare of the people of this country.

"The tour will be watched with keen interest throughout the United States."

State Trailer Regulations

Trailer Manufacturers' Association Points Out Lack of Uniformity in Various States

While lack of uniformity in trailer regulations and excessive license fees hamper the development of highway transportation, according to the Trailer Manufacturers Association, "eventually a balance will be struck that will protect the highways sufficiently without stifling the growth of the only means of using the highways that promises any relief to the consumer in the matter of prices."

The statement cites recent laws limiting the weight and dimensions of trucks and trailers and others fixing the license fees. New laws limiting weight are noted as follows:

"Pennsylvania: 26,000 lb., gross weight of vehicle and load.

"Wisconsin: 24,000 lb., gross; 18,000 lb. on one axle, and 800 lb. per inch width of tire.

"Indiana: 10 tons, gross.

"Illinois: 16,000 lb. on one axle, and 800 lb. per inch width of tire.

"North Carolina: 5½ tons, load capacity.

"Iowa: 14 tons, gross; 4 tons on any wheel, and 800 lb. per inch width of tire."

Three state laws prescribing maximum dimensions are cited as follows:

"Pennsylvania: Length of a single vehicle, 28 ft.; width, 90 in.

"Wisconsin: Length of vehicle, 30 ft.; width, 96 in.; length of trailer train, 100 ft., between 8 p. m. and 5 a. m.

"Illinois: Length of train, 65 ft."

Laws fixing the registration fees for trucks and trailers are given as follows:

"Pennsylvania: From $15 for a truck of 2 tons capacity to $150 for a 7-ton truck; from $2 for a trailer weighing 500 lb. to $15 for one weighing more than 2,000 lb. (Trailers weighing less than 500 lb. exempt.)

"Indiana: From $6 for trucks of ¼ ton capacity to $50 for 7½ tons or more; trailer fees one-half of truck fees.

"Illinois: From $15 for truck or trailer weighing 7,000 lb., with load, to $60 for more than 15,000 lb., gross weight.

"North Carolina: From $12 for a truck of 1 ton capacity or less to $100 for 5½ tons capacity; trailers, $10 for first ton of capacity and $20 for each additional ton.

"Iowa: From $15 for trucks of 1 ton capacity or less to $175 for solid-tired trucks of 6 tons capacity; trailers, $10 for 1 ton capacity to $70 for solid-tired 6-ton trailer. Rubber-tired trailers under 1,000 lb. capacity, used with passenger automobiles for personal baggage or effects, are exempt."

With a view to removing these inequalities, the association is urging the enactment of uniform motor vehicle laws and has formulated a set of recommendations for trailer regulation. It is urged that trailer fees should be less than truck fees, because of the absence of driving wheels, and that the only weight limitation should be one based on tire width. It is also maintained that since trailers are so designed that the wheels track with the rear wheels of the towing truck or tractor, trailer trains do not interfere with or endanger traffic and the number of trailers in a train should not be limited to one or two. "If cities are authorized to limit the number in congested streets and districts during the daytime," according to the statement, "the safety and convenience of general traffic will be sufficiently guarded and the development of economy of haulage in remote mining, lumbering and agricultural sections will not be prevented."

Contracts amounting to about $6,600,000 have been, or are soon to be, awarded in New York State, according to a recent statement by State Highway Commissioner Greene.

The State Roads Commission of Maryland will expend approximately $3,000,000 for new construction this year, according to a recent statement by Chairman Zouck. He also stated that most of the roads built during the present season would be 15 or 16 ft. wide instead of the usual 14 ft.

State Road Work in Oregon is giving employment to over 8,000 men at an average wage of $6 per day, according to a recent report by State Highway Engineer Nunn. There are now about 923 mi. of road under construction, the cost of which will be approximately $12,829,000. The daily payroll is about $50,000, and this is expected to be increased within a short time. The work under way includes about 354 mi. of paving, 127 mi. of macadamizing, 42 mi. of grading and 60 bridges.

The Voters of Pittsburgh, Pa., recently approved a bond issue of $22,000,000 for public improvements. One of the projects is the Monongahela Boulevard, which will be built along the north shore of the Monongahela River, from Grant St. and Second Ave. to Craft Ave., at a cost of about $2,000,000. Another piece of work covered by the issue is the widening of Second Ave. between Liberty Ave. and Grant St. The avenue will be widened 30 ft., making the width 80 ft., at a cost of about $1,400,000.

The Charter of the City of Philadelphia, Pa., has been changed in several important particulars by the 1919 Legislature. Under one of the new provisions the city will do its own street cleaning and will collect and dispose of its garbage, rubbish and ashes after Dec. 21, 1920, unless the council, by a majority vote and with the approval of the mayor, authorizes the letting of contracts for the work. If this is done, the present restriction limiting the life of a contract to one year will no longer hold, but in case a contract for more than four years is made, the city may terminate it at the end of that time or at any time subsequently, without being liable for damages to the contractor. Another change in the charter does away with the present city council of two chambers and replaces it by a single council.

MEETINGS

Calendar of Coming Meetings

Aug. 13-15.—North Carolina Good Roads Association.—Annual convention, Wrightsville, Beach, Wilmington, N. C. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

Nov. 12-14—American Society of Municipal Improvements.—Annual convention, New Orleans, La. Secretary, Charles Carroll Brown, 304 East Walnut St., Bloomington, Ill.

Feb. 9-13, 1920—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Northwestern Highway Improvement Association

A meeting of the Northwestern Highway Improvement Association was held at the Cook County board rooms, Chicago, Ill., on Wednesday, July 23.

The association is promoting the construction of the Northwestern Highway along the line of the Chicago & Northwestern R. R., and most of the time at the meeting was devoted to the discussion of that project. Wm. G. Edens, President of the Associated Road Organizations of Chicago and Cook County, presided.

North Carolina Good Roads Association, State Association of County Commissioners and North Carolina Automobile Association

The 20th annual convention of the North Carolina Good Roads Association, the 12th annual convention of the State Association of County Commissioners and the annual meeting of the North Carolina Automobile Association will be held at the Auditorium, Harbor Island, N. C., on Wednesday, Thursday and Friday, Aug. 13, 14 and 15, instead of at Wrightsville Beach on Aug. 6, 7, and 8, as previously announced in these columns.

The meeting will be called to order at 10:30 a. m., on Wednesday. Addresses of welcome will be made by Roger Moore, President of the Chamber of Commerce of Wilmington, and W. A. McGirt, President of the North Carolina Good Roads Association. Short responses will be made by A. M. McDonald, Acting President of the State Association of County Commissioners; H. B. Varner, Ex-President of the North Carolina Good Roads Association, and C. M. Vanstory, President of the North Carolina Automobile Association. These will be followed by the presentation of the reports of officers and committees of the North Carolina Good Roads Association and the appointment of various committees of the three associations represented.

At this session, M. O. Eldridge, Director of Roads of the American Automobile Association, will present a paper on "The Need of a Nation."

The afternoon session on Wednesday will be devoted to the presentation of papers and to discussions. The papers scheduled are as follows: "Classification of Highways," by H. G. Shirley, Secretary of the Highway Industries Association and of the Federal Highway Council; "Value of Hard-Surfaced Roads, Adequately Maintained, as Illustrated by the French Roads," by Joseph Hyde Pratt, Colonel, 105th Engineers, 30th Division; and "Concrete in Road Building and Important Factors in Its Use," by A. N. Johnson, Consulting Highway Engineer, Portland Cement Association.

On Wednesday evening there will be an address by Senator John H. Bankhead, followed by an exhibition of moving pictures of road building in Illinois, supplied by the Portland Cement Association.

At the morning session on Thursday, A. J. Maxwell, State Corporation Commissioner, will speak on "County Taxation." The reports of officers of the State Association of County Commissioners will follow this address. The remainder of the session will be given up to five-minute reports on special state highways as follows: Wilmington-Charlotte-Asheville Highway; Wilmington-Goldsboro Highway; Wilmington-New Bern Highway; Dixie and other highways passing through Asheville; Bankhead Highway; Northeastern Highway; Central Highway.

"County Government" will be the subject of an address by Rev. A. T. Lindsay, County Commissioner of Gaston County, at the afternoon session. This will be followed by a general discussion of county problems. Late in the afternoon there will be a tour over the roads of New Hanover County, in the course of which a demonstration of the maintenance of worn-out macadam with Tarvia and stone chips will be given by the Barrett Company.

Thursday evening will be devoted to committee meetings and a dance.

The closing session on Friday forenoon will be devoted to reports and to business meetings. The reports will include statements on road work in twenty-two mountain counties and special reports from Lenoir and Beaufort Counties. The last two will be presented by Ernest V. Webb, Chairman of the Board of County Commissioners of Lenoir County, and E. L. Stewart, of Beaufort County.

These will be followed by a round table discussion on hard-surfaced roads of various types, led by W. C. Boren, of Guilford County.

Business meetings of the three associations will be held at 11:30.

Texas Counties have recently voted bonds as follows: Fayette County, $75,000; Washington County, $1,500,000; and Webb County, $300,000.

The Canadian Parliament has passed a bill providing $20,000,000 for aid to the provinces in road building. The law provides for appropriations extending over a period of five years and specifies that $80,000 annually shall be granted to each province, the balance to be apportioned to the provinces on the basis of population. The aid extended by the Dominion is to amount to 40% of the total cost of the work.

The Post Office Department now has in operation 31 main truck routes, according to "Highway Transportation," the organ of the Motor Truck Association of America. These routes cover 3,781 mi. of road. In the parcel post service alone, it is stated, there are 104 trucks and 208 operators employed, and 12 cities are using motor truck parcel post service. These cities are Washington, St. Louis, Pittsburgh, Philadelphia, New York, Nashville, Indianapolis, Detroit, Chicago, Buffalo, Brooklyn and Boston.

PERSONAL MENTION

C. E. Hoff has been apointed county engineer of Bexar County, Texas.

Samuel Hill, of Seattle, Ore., has returned from a four months' tour of England, Belgium and France.

L. R. Ash has resigned as city manager of Wichita, Kan., to return to the firm of Harrington, Howard & Ash, of Kansas City.

Capt. Charles Caulson, formerly with the Canadian Expeditionary Forces, has been appointed city engineer of Welland, Ont.

J. J. White has resigned as engineer of one of the road districts of Freestone County, Texas, and Bryant and Huffman have been retained for the entire county.

H. H. Lotter has been appointed a resident engineer of the Bureau of Public Roads, U. S. Department of Agriculture, and has been assigned to Missouri, with offices at Jefferson City.

E. G. Briggs has resigned as sidewalk engineer of the Department of Public Works of St. Paul, Minn., to become connected with Gaynor & Gaynor, consulting engineers, Sioux City Iowa.

George F. Dewey has entered consulting practice with F. C. Dwiggins, under the firm name of Dewey & Dwiggins, at Cairo, Ill. Mr. Dewey has been city engineer of Cairo for several years.

C. J. White has resigned as a resident engineer of the Northern Pacific Ry. to become an assistant highway engineer of the Minnesota State Highway Department, with headquarters at Pine River.

N. S. Mullican, for the past two years chief highway engineer of Davidson County, North Carolina, has been appointed consulting engineer of Davies County. He will retain his position with Davidson County.

Lieut. Gerald F. Healey has been discharged from the service and has entered Government employment in the Bureau of Public Roads, U. S. Department of Agriculture. He was formerly with the New York State Highway Department.

J. H. Conzelman, formerly engineer of tests in the department of roads and pavements of the Pittsburgh Testing Laboratory, with offices at Birmingham, Ala., has been appointed district manager of the laboratory recently established at Little Rock, Ark.

F. G. Eason has resigned as senior drainage engineer with the Bureau of Public Roads, U. S. Department of Agriculture, to become associated with McCrady Bros. & Cheves, civil engineers, Charleston, S. C. Mr. Eason will have charge of the drainage and road department.

R. L. Morrison, who has been professor of highway engineering at the Agricultural and Mechanical College of Texas for several years, has resigned to become associated with the Pittsburgh Testing Laboratory. Prof. Morrison will be engineer of tests in the laboratory's department of roads and pavements, with offices at Birmingham, Ala.

Maj. W. W. Burden, 12th Engineers, U. S. A., has been discharged from the service and will return to the engineering corps of the City of St. Louis, Mo.

James P. Nash has withdrawn from the firm of Bryant, Huffman & Nash, Austin, Texas, to engage in private practice.

Lieut. Guy Brown, of the 314th Engineers, U. S. A., has been discharged from the service and has resumed his former position with the engineering force of the city of St. Louis, Mo.

B. F. Affleck, President of the Universal Portland Cement Co. and of the Portland Cement Association, has been elected a director of the Great Lakes Trust Co., which commenced business at Chicago, Ill., on July 22.

Wallace L. Caldwell, formerly district manager of the Pittsburgh Testing Laboratory, at Birmingham, Ala., has been appointed director of the laboratory's department of roads and pavements, with headquarters at Birmingham.

J. G. Palmer has been appointed city engineer of Kewanee, Ill. Mr. Palmer was previously an assistant engineer in the Department of the State Engineer and Surveyor of New York and later United States Junior Engineer, Corps of Engineers, U. S. Army.

Walter W. Smith has been promoted to the position of assistant sales manager of the Nash Motors Co., of Kenosha, Wis. Mr. Smith has been with the sales department of the Nash Company since it took over the Thomas B. Jeffery Co. Last January he was made manager of passenger car sales.

Brig. Gen. Wilds P. Richardson, who has been in command of the American troops in northern Russia, has been ordered to return to the United States, with his staff, at the earliest date possible, according to recent advices. Gen. Richardson formerly served as president of the Board of Road Commissioners for Alaska.

Lieut. Col. J. M. Richie, of the Motor Transport Corps, U. S. Army, has been designated a member of the Highways Transport Committee of the Council of National Defense. Col. Richie, who has taken a very active part in matters pertaining to highway transportation, is the author of the article "Motor Transportation by the Army," which appeared in "Good Roads" for July 23.

OBITUARIES

John C. Rodgers died at New York, N. Y., on July 26. Mr Rodgers was 75 years old and had been engaged in the contracting business in New York for 40 years. Among the public works he had handled were parts of Riverside Drive and the old subways.

Col. James Kilbourne, President of the Kilbourne & Jacobs Mfg. Co., Columbus, Ohio, died recently at that city. Col. Kilbourne was a graduate of Kenyon Technical College and Harvard University. After practicing law for several years he founded the company of which he was the head at the time of his death.

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Silence The lumbering trucks which pass through Norwood Avenue, Long Branch, New Jersey, as part of the main highway route along the Jersey coast resorts, make little noise in running over the smooth, resilient surface of TEXACO.

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Service Withstanding the wear of ton-laden caravans which transport food, furniture and hotel supplies to the large Jersey shore resorts, TEXACO presents one more of its many universal proofs of SERVICE.

This photograph shows TEXACO SHEET ASPHALT Pavement on Norwood Avenue, Long Branch, N. J., laid in 1918 by the William P. MacDonald Construction Company.

Photographed July 6, 1919.

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVI.
New Series, Vol. XVIII.

NEW YORK, AUGUST 13, 1919

Number
7

Highway Maintenance in Wisconsin—I*

Plan Adopted by the Wisconsin Highway Commission for Taking Care of Highways by the Patrol System—Duties of Patrolmen

For the purpose of efficiently handling the different road problems, the Highway Commission has divided the state into eight divisions, comprising from seven to eleven counties each. The division office, located at a central point, is in charge of a division engineer with a sufficient force to handle the work in his counties. Assistant division engineers have charge of the construction and maintenance work in each division, under the direction of the division engineer. The county state road and bridge committee of each county, which is an administrative body, has general charge of the maintenance work. The county highway commissioner has direct charge of the patrolmen and gangs on maintenance work.

Patrol Sections.—The basic idea of installing a patrol system of maintenance is to place the responsibility for the maintenance of a certain section of road upon one person only, and in order to do this the patrolman must have direct charge of all work done in a certain section. To insure this, each county is divided into patrol sections varying in length from 6 to 20 mi. each, and a patrolman is placed in charge of each individual section. The sections are so selected that, if possible, each section has but one type of road.

The trouble in the past has been that no one in particular was responsible for the maintenance of any given section of road. A town or county would construct a very good road, provide proper drainage and culverts and a reasonably good surface in many instances, but, due to the lack of maintenance at the proper time, much of the investment would soon be lost.

This all important difficulty has been largely overcome by establishing a patrol system of maintenance.

Patrolmen

The position of patrolman on the state trunk highway system is one of the utmost importance to the traveling public, and the greatest care is exercised in selecting the man.

The job must be made so attractive that the patrolman will take a live interest in his work, give satisfaction to the public and remain on the same section from year to year.

To attract good men, a monthly salary commensurate with the work to be performed is paid and the patrolman given steady employment for the entire maintenance season which averages about eight months, throughout the state. He is given extra work outside of the maintenance season, at times when extra dragging is necessary and in those sections where winter hauling is practicable. He has at his command a sufficient fund to allow him to employ extra men and teams when necessary and to pay for materials and supplies used on his section.

The division engineer and his assistants note the condition of each patrolman's section upon each visit, and at the end of the season a rating is given the patrolman, taking into consideration, of course, the soil and material, the weather, the condition in which he received his section and the amount of work required. He is rated either excellent, good, fair or poor.

We believe this plan stimulates each patrolman to do his very best and will result in much better maintenance. As an additional inducement to better work and longer service, the commission has installed a bonus system for 1919. Each patrolman in the employ of the county at the close of the maintenance season, who has adequately maintained his section, will be allowed a bonus of $5.00 per month for each month he works, the bonus to be in addition to the monthly salary named in the contract.

Qualifications.—A patrolman should possess more than ordinary qualifications and ability. He must be honest, sensible, even-tempered, healthy, a good worker, and willing to learn. He must have brains and demonstrate to the traveling public that he knows how to use them.

Duties.—1. He must execute a bond to the county in the sum of $500 for the faithful performance of his duties and to insure the care of the machinery in his charge.

2. Give his entire time to the work during the maintenance season and work ten hours per day.

3. Furnish a team and wagon satisfactory to the county.

4. Be responsible, at the county's expense, for keeping in repair the machinery and tools assigned to his section, and furnish an inventory of the same to the county at the end of the maintenance season.

5. Properly grade and drain the road surface, keep the grass cut back from the shoulders, maintain a proper crown

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* From "Highway Maintenance," Bulletin No. 8, Wisconsin Highway Commission, a publication devoted especially to patrol maintenance on the state highway system, compiled by J. T. Donaghey, Maintenance Engineer.

and keep the surface smooth and even by use of the light grader or planer.

6. Provide additional drainage, where necessary, away from the road ditches; and keep all culverts and ditches free and open.

7. Add new material to the surface where necessary.

8. Cut all weeds and grass between ditches and around culvert end-walls, mileposts and signs.

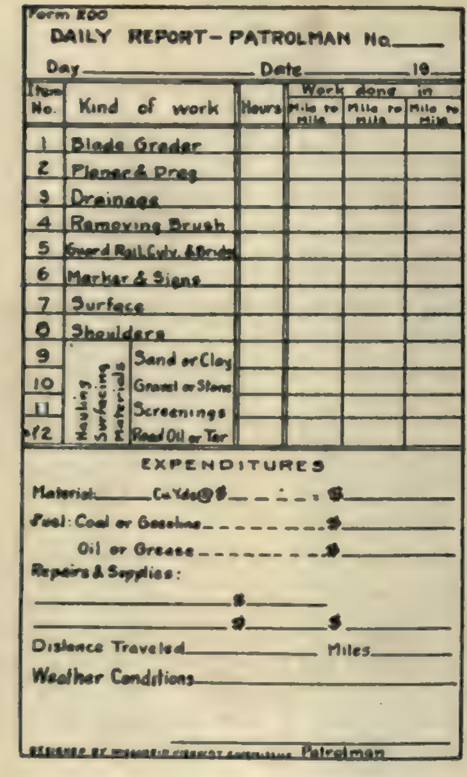
9. Remove trees, brush and weeds from the roadside and at dangerous turns.

10. Protect side banks and fills by sowing grass seed or by sodding.

11. Construct and repair guard fence, riprap ditches and the toes of fills with cobblestone where they are inclined to wash.

12. Properly maintain all signs and markers; maintain detours around construction work, and keep all detour signs in place.

Reports.—Report blanks are furnished by the county to all patrolmen. Each patrolman is required to mail a daily and a monthly report to the county highway commissioner, as shown on Forms 200 and 201. The daily report must show the hours worked, the character and location of such work and the extra expenditures for the day, if any. It must also show weather conditions for each day. The monthly reports are made by assemblying the daily reports and must be exact duplicates of the same. After the commissioner has checked up the monthly report with the daily reports, the monthly report must be forwarded to the division engineer's office.



Form 200

DAILY REPORT—PATROLMAN No.____

Day________ Date________19__

Item No.	Kind of work		Hours	Work done in		
				Mile to Mile	Mile to Mile	Mile to Mile
1	Blade Grader					
2	Planer & Drag					
3	Drainage					
4	Removing Brush					
5	Guard Rail, Culv. & Bridges					
6	Marker & Signs					
7	Surface					
8	Shoulders					
9	Hauling Surfacing Materials	Sand or Clay				
10		Gravel or Stone				
11		Screenings				
12		Road Oil or Tar				

EXPENDITURES

Material______Cu.Yds.@$\_\_\_\_\_\_$______

Fuel: Coal or Gasoline________$______

Oil or Grease________$______

Repairs & Supplies:

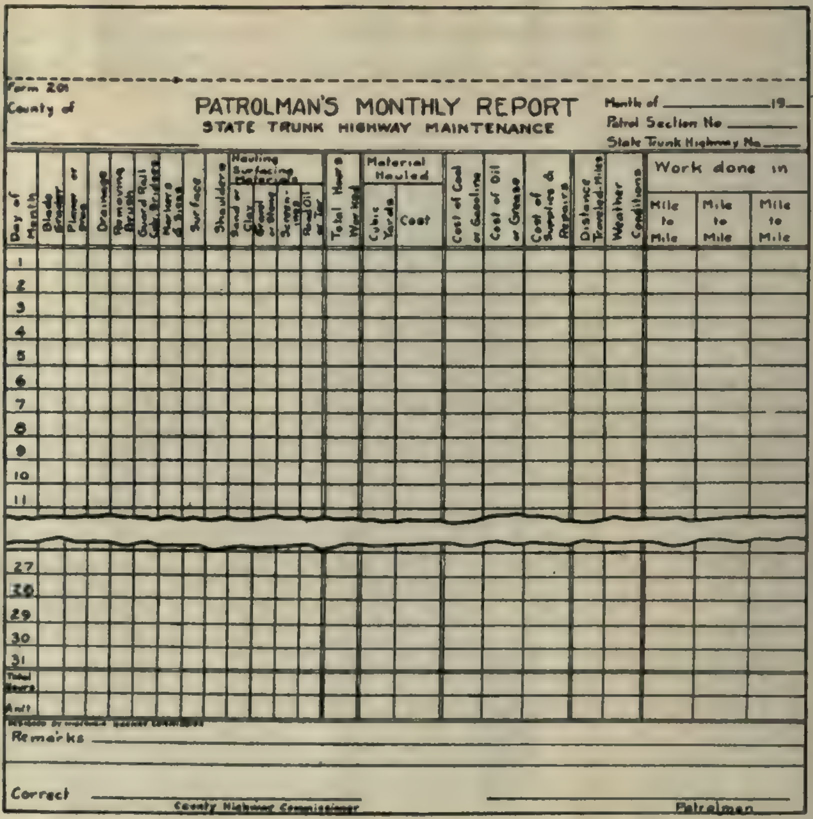
__________$______

__________$______$______

Distance Traveled________ Miles______

Weather Conditions____________

[illegible] __________ Patrolman



Form 201

County of ________

PATROLMAN'S MONTHLY REPORT

STATE TRUNK HIGHWAY MAINTENANCE

Month of ________19__

Patrol Section No ______

State Trunk Highway No.______

Day of Month	Blade Grader	Planer or Drag	Drainage	Removing Brush	Guard Rail Culv. Bridges	Markers & Signs	Surface	Shoulders	Hauling Surfacing Materials				Total Hours Worked	Material Hauled		Cost of Coal or Gasoline	Cost of Oil or Grease	Cost of Supplies & Repairs	Distance Traveled Miles	Weather Conditions	Work done in		
									Sand or Clay	Gravel or Stone	Screenings	Road Oil or Tar		Cubic Yards	Cost						Mile to Mile	Mile to Mile	Mile to Mile
1																							
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
27																							
28																							
29																							
30																							
31																							
Total Hours																							
Am't																							

[illegible]

Remarks ____________

Correct __________ County Highway Commissioner __________ Patrolman

DAILY AND WEEKLY REPORT FORMS FOR WISCONSIN PATROLMEN.

No patrolman's salary will be paid until the maintenance reports required of him shall have been received by the commissioner.

Information.—The patrolman must be familiar with the road laws, automobile laws and rules of the road. He must know all important places on or near the trunk highway of which his section is a part, and where his trunk highway intersects others. He must help the traveling public when in trouble, and must not make charges for such assistance. He is expected to act as a general information bureau for the public at large, and perform his duties in a gentlemanly and pleasing manner.

Distinguishing Number or Badge.—The patrolman must wear on his hat or cap a distinguishing number or badge, corresponding to the number of his section. He must have painted on the side of his wagon box the standard marker used in marking the system; also the number of his section. At each end of his section his name and number appear, so that the public may know who is actually in charge of that particular section, the whole idea being to place responsibility for the maintenance of each particular section on one man and one only.

Flag.—The patrolman is furnished with a small flag which carries the standard design used in marking the system. Should it be necessary for the patrolman to leave his section during the day, he must place the flag alongside the road in a conspicuous place at the point where he left it. This enables the county highway commissioner, division engineer or others interested in the work to readily locate the patrolman if they should happen along during his absence, and also serves to give the public somewhat of a check upon his activities.

Equipment.—The patrolman must furnish a good team and wagon, satisfactory to the county. If advisable, at times he may substitute a light tractor or motor truck for the team, by permission of the county highway commissioner. The county furnishes all machinery and tools, charging them to the patrolman. Machinery or tools broken by ordinary use or worn-out are replaced by the county and those lost must be replaced by the patrolman.

The patrolman's equipment consists of a 4-horse road grader, road planer, large slip scraper, road plow, stone boat, tool box, axe, bar, pick, shovel and other small tools necessary.

Where thought advisable a light motor truck may replace the team. When the truck is furnished by the county, the patrolman's wages are adjusted accordingly.

Placing and Maintaining Markers.—The patrolman usually assists in marking the state trunk system and erecting mileposts and signs. Upon application to the division engineer, a stencil is furnished each patrolman for use in his section. If any sign or marker is marred or mutilated, it is his duty to see that it is satisfactorily replaced or repaired immediately.

Maintaining Detours.—Where sections are to be improved by state aid or federal aid construction and it becomes necessary to divert travel around such construction, it is the patrolman's duty to place detour signs and maintain the road comprising such detour in a reasonably safe condition for the public to travel. Wherever possible, a temporary road must be maintained along the side of the road under construction. Except on concrete construction, this is nearly always possible.

There is more criticism due to the lack of properly signed and maintained detours around our construction, and especially around culverts and bridges, than from any other one cause.

Be sure to place the detour signs in conspicuous places and at the points the travel must leave the main roads. Detour signs are furnished by the State Highway Commission, on request.

Planning Work.—A good patrolman always finds something to do and has his work well arranged in advance. He plans to cut brush, weeds and grass and to repair guard fence, bridge floors, signs and markers at such times as the weather conditions will not permit doing work on the road surface. On surfaced sections he keeps a good supply of repair material along the roadside available for immediate use when required. In fact, he handles the entire section just as if it were his own.

There is no excuse for a patrolman not being out and doing something at any time when it is not actually raining.

(To be continued)

Surface Treatment for French Roads

By CAPT. CHARLES E. MURPHY*

In carrying the stupendous burdens of war traffic for four years, the highways of France certainly demonstrated the intrinsic value of strongly built, hard-surfaced roads. But it was an unfortunate circumstance that the French roads could not have received surface treatment before the immense motor truck trains began to cause disintegration and general breakdown of the highways.

Most of the main highway routes in France leading from principal cities, are of the old fashioned macadam type. Early in the war the French realized that their railway system was not capable of solving the enormous transportation problems of war, and in conjunction with the other Allies, the French Government concentrated its efforts in forming large squadrons of motor trucks for the transportation of troops and supplies.

This plan meant that the highways would receive a supreme test in standing up under such heavy traffic. The main routes from Paris, Toul, Tours and other centers of supplies were subjected to severe strains, for immense loads were passing over them day and night. During the first few months of the war, the French engineers found that the roads stood up fairly well, but soon the wear and tear began to show its effect.

ONE OF THE NATIONAL ROADS OF FRANCE.

It was at this time, when the roads showed the first signs of disintegration, that surface treatment would have saved the day. The application of heavy bituminous road oil or binder would have meant the saving of inestimable human labor, as men had to be put to work on the highways as soon as they started breaking up. If the road had been treated, even after the first surface of the macadam roads had been ground to dust, the preservative would have protected the larger stones which rapidly deteriorated under the heavy traffic.

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*Asphalt Sales Department, The Texas Company.

As the French roads are not excelled anywhere in the world when it comes to proper drainage, the application of a proper bituminous road oil or a binder would have formed a protective mat, which would have easily withstood the heavy rains and traffic pressure which the highways had to undergo. The French engineer officers are frank in their admission that the Americans have the right idea in surface treating their roads before they begin to disintegrate.

American Soldiers Advocate Good Roads

Writer in "Amaroc News," Official Organ of the American Army of Occupation, Urges Necessity of Road Betterment in America

The time is approaching when all of the expeditionary force will return across the seas; it is inevitable that their thoughts should be more and more of home, their minds relieved of the worry and stress of war. All are looking forward to the future with open minds and believe that each one is going home and begin to consider what seems to him is necessary to be done in order to promote the general welfare of the community in which he lives. The possibilities for clear thinking are greater now than ever before in the history of America, the possibilities are unlimited unless we fail to realize what the problems are, and adopt proper methods in meeting and solving these conditions. If we adopt the same attitude in overcoming the problems of peace, that we did in solving those raised by the war, there can be no doubt as to the role our country shall fill in the immediate future. We have profited, let us lead, and be first now under the new world to go ahead, wake up from our drowsiness and accomplish deeds commensurate with the American ideals. America has made a wonderful record during the war; her fame has spread far and wide by the manner in which her men responded to the call to arms. Are we to show less foresight or less determination in meeting the problems of peace? Are we to add new lustre to the reputation already won or are we going to sit still and see that reputation fade away because again we fail to recognize and overcome our conditions? In other words, shall we continue to progress? The answer is, "we shall." Immediately after peace is terminated, what is our greatest problem?

The most urgent necessity of our country in the immediate future is "good roads," permanent roads, roads that can be used twelve months in each year. This need has been only too apparent to most of us in the past, but in spite of the need and in spite of the enthusiasm on the part of many, the opposition of others has in the past acted as a check to getting anything done. If these obstructionists had died on the field of honor they would have died in vain. There isn't a greater crime in the U. S. and never will be. If the fly-by-night politicians had been with our armies in France during the past eighteen months and seen the wonderful roads of France, Belgium, Luxemburg, Italy and Germany they would have a better understanding of what good roads mean to a country. If they had seen the miles and miles of traffic moving over the network of near perfect roads behind our always advancing doughboys, a realization would come of what good roads mean to a country.

In no small measure the success of the Allies is due to the great arteries of travel which the foresighted French nation had constructed in times of peace. Subjected to a constant stream of heavy traffic for over four years, such as is largely beyond the imagination of those who have not seen for themselves, these roads stood the test summer and winter, spring and fall, and made possible those victories which resulted in driving the Hun back across the Rhine. Whether those who are opposed to the constructing of good roads are purposely blind to all these facts is not known. In a true sense they are obstructionists. They are a drawback to any community. They are uncivilized. America, because of our government, permits these creatures to hibernate and live among us.

The Joint Committee on Federal Aid in the construction of post roads, Sixty-third Congress, failed to realize its purpose and showed a lack of definite information, particularly as to the amount of tonnage hauled over the public roads.

The Department of Commerce has collected an enormous amount of data regarding the total crop production of America but did not report the amount hauled over dirt roads by wagons or automobile trucks.

The Interstate Commerce Commission has gathered statistics regarding the amount of freight hauled over the railroads of America with a view to solving the problem of transportation and did not mention or offer any solution of the enormous amount of transportation involved before the products reach the railroads for transportation. Up to the present time all have failed to get the vital facts necessary to accomplish the end desired in road construction and to successfully apply the money appropriated for the federal aid of road construction, and many states have not enacted proper laws or have failed to institute the proper highway commission and appropriate money which is necessary to receive the federal aid.

The roads of America today are absolutely inadequate, inefficient and antiquated. They are not designed to carry the heavy traffic now. What will become of them in the future? There are over 2,750,000 mi. of highways in the United States. Of this amount, less than 275,000 mi. have any form of surfacing whatsoever. The reports by the Department of Agriculture indicate that the increase in mileage is about 50,000 per annum, that is, new roads, while about 15,000 mi. are being improved per annum. Therefore, the mileage of new roads is three times greater than the amount surfaced yearly.

It is a vital problem, this question of roads, one that reaches down into the very foundation of our social and economic scheme of life.

A national investigation into highways transportation by a federal highway commission will provide this basis; increased road funds will give us the motive power.

France has spent millions on her roads and spends thousands annually maintaining them. What are the results? Many people of America come here on their vacations, bring motor cars and drive over the beautiful country. Each road, it matters not how small or how seldom used, has its quota of beautiful shade trees whose limbs form an arch to protect its patrons from the sun. These roads are permanent, wide and continuous.

How many people of America really have seen "America First?" Why not? Because we have not the roads that we can use at our will with any degree of pleasure and comfort. How many tourists have motored in California or seen Yellowstone National Park, visited the Roosevelt Dam or motored through the vast plains of Arkansas or

(Continued on page 92)

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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THE PATROLMAN AND HIS JOB

To the motorist or other road user the patrolman's job probably seems a humble one that calls for no special qualifications and involves no considerable measure of responsibility. The traveler sees only a man wielding a pick or a shovel, driving a team hitched to a road drag, cutting brush or cleaning out culverts or ditches. Apparently he is only a laborer like the shoveler in a sewer trench or the roustabout on a dock, the only difference being that he works without visible supervision and may appear to be invested with some degree of authority.

The road builder knows better. The layman can learn how erroneous this view really is by reading the list of qualifications for patrolmen on the Wisconsin state trunk roads, that are set forth on other pages of this issue.

As is pointed out in the article referred to, the position of patrolman on a state trunk line system is one of the greatest importance. The service rendered by a road is quite as much dependent upon the way in which the road is maintained as it is upon the method by which it was built. And the service rendered is the only true measure of a highway's value as one of the factors in transportation.

A patrolman, according to the Wisconsin specifications, must be "honest, sensible, even-tempered, healthy, a good worker, and willing to learn." With the addition of education and training, those qualifications would be sufficient for almost any task, and since the bulk of the world's work is done by workers with little or no education and generally without training except that gained in the performance of their every-day work, it should be evident that the patrolman ranks well in advance of the majority of workers. Indeed, he belongs in that class between the manual laborer and the brain worker to which both brain and brawn are essential to success. He deserves greater appreciation from the public he serves.

FRENCH ROADS AND AMERICAN SOLDIERS

A few millions of America's young men have spent parts of the past two and a half years in undergoing experiences that can hardly fail to exert a lasting influence upon their lives. All of them have been subjected to military discipline and all of them have learned much, both by precept and by experience. A large proportion of them have served in a foreign country and have had the benefit of the broadening influence that comes from contact with new people, unfamiliar customs and different conditions. It is inevitable that many of them should come back to civil life with new ideas and ideals, with altered tastes and ambitions and with a better understanding of modern business, social and political problems.

That these conditions are of more than passing interest in some quarters is evidenced by the solicitude that is frequently displayed over the so-called soldier vote. This interest is generally manifested by those whose viewpoint is purely political, and it is justified, in a measure, by the likelihood—if not the certainty—that the returned soldiers will have pretty decided views on some of the vital questions of public policy.

One of the subjects upon which the ex-soldier's opinions will doubtless be rather thoroughly crystallized is that of good roads. The American public has been told many times, and apparently on good authority, that the American soldiers would come back from France strong advocates of better roads. They have seen the roads of France, we are told, and have seen what they meant to her in her extremity. They saw convincing demonstrations of the possibilities of motor transport over roads equal to its demands. They realize that the possibilities of the motor truck and the commercial passenger vehicle are not limited to war-time; that they can be utilized to as great advantage in times of peace.

What one soldier, still in France, thinks about the matter is set forth on other pages of this issue. The article in question, "American Soldiers Advocate Good Roads," was written by a member of the American Army of Occupation and printed in the official organ of our force stationed in Germany. It was sent to the United States by Lieut. Theo. E. Damm, Manager of the "Amaroc News," who wrote that the American soldiers abroad were going to be vitally interested in seeing a national highway system established in this country.

While those who believe in bettering America's highways —and that means every one who has given the matter of the country's transportation needs even ordinarily intelligent consideration—will welcome the support of the soldiers in efforts to further road improvement, we ought not to belittle what has already been accomplished in this country. It is true that the roads of the United States are inadequate to the demands upon them, but it must be remembered that a statement of that kind refers only to the American road system as a whole, and that that whole comprises over two and a half million miles. And in compariing American with French roads, the total areas of the two countries, the total mileages of roads, the total mileages of improved roads, the densities of population, the ages of the two countries and many other conditions must be taken into account. France has an area of a little more than 207,000 sq. mi. and about 520,000 miles of roads; the United States has an area of approximately 3,000,000 sq. mi.—not including nearly 600,000 in Alaska—and approximately 2,500,000 mi. of roads. Estimates of the total mileage of "improved" roads in France that would be fairly comparable with similar estimates for this country are not available, but it is of interest to note that the 20% of our roads upon which it is estimated that

80% of our traffic is carried is very nearly as great as the total French mileage. Again, with an area about fourteen times as great as that of France, we have a population less than three times as great. And such progress as we have made already has been made in much less time than that through which the French have been bettering their roads.

If, instead of comparing our accomplishment with that of the French upon the basis of mileage improved, we do so upon the basis of quality of construction, we still have no cause to feel inferior. The really good roads of America are quite as good as the really good roads of France. In many respects they are better.

Only in maintenance are French methods and French acchievements superior to ours; and in the careful, continuous maintenance of the roads of France lies the secret of the admiration they arouse in those who see them. Most of the improved roads of France are of water-bound macadam—a type that is particularly responsive to intelligent care. They are kept in excellent condition at all times, and naturally make a most favorable impression upon Americans —who are too frequently accustomed to roads that are built well and then left to take care of themselves, so to speak.

Let us by all means exert every possible effort to avail ourselves of the support of the returning soldiers in the work of providing the United States with an adequate highway system. But let us approach the work not with the idea that we have achieved nothing and are hopelessly behind France or any other country, but with faith in what we have already done, a clear conviction of our ability and a fixed determination to put the United States in the front rank so far as her roads are concerned.

Bond Issues by Georgia Counties

Thirty-eight Counties Vote Issues of Over $14,000,000—Issues of Over $5,000,000 Pending in Others

Thirty-eight counties of Georgia had voted bonds amounting to over $14,000,000 and 14 other counties were to vote on issues amounting to a total of over $5,000,000 within a few weeks, according to statistics made public late in July. The funds derived from the sale of all of these bonds are expected to be used in connection with federal aid, and it is reported that the authorities of 15 other counties are awaiting action by the Legislature before deciding upon the amounts of contemplated bond issues and fixing dates for the elections.

The counties in which bonds had been voted at the time the figures were given out, with the amounts of the issues, are as follows: Bibb, $700,000; Sumter, $500,000; Colquitt, $500,000; Walton, $200,000; Evans, $40,000; Coweta, $480,000; Thomas, $700,000; White, $100,000; Hall, $600,000; Lumpkin, $75,000; Charlton, $100,000; Laurens, $500,000; Pulaski, $200,000; Spalding, $350,000; Jackson, $100,000; Glynn, $350,000; Berrien, $350,000; Tift, $300,000; Dougherty, $400,000; Morgan, $325,000; Banks, $75,000; Crisp, $350,000; Troup, $500,000; Lowndes, $500,000; Wilkes, $300,000; Elbert, $200,000; Clarke, $250,000; Towns, $100,000; Dawson, $60,000; Union, $60,000; Chatham, $2,500,000; Grady, $250,000; Worth, $400,000; Ware, $630,000; Brooks, $500,000; Cook, $250,000; Mitchell, $400,000; Murray, $100,000.

The 14 counties in which elections were to be held within a few weeks, with the amounts proposed, are as follows:

Bartow, $400,000; Bulloch, $400,000; Hart, $200,000; Baldwin, $100,000; Pierce, $300,000; Richmond, $700,000; Wayne, $350,000; DeKalb, $1,000,000; Forsyth, $100,000; Muscogee, $750,000; Cobb, $600,000; Fannin, $140,000; Dade, $75,000; Barrow, $200,000.

In addition, it is expected that bond issues will be voted upon in the Counties of Gordon, Floyd, Carroll, Wheeler, Appling, Clinch, Coffee, Toombs, Tattnall, Franklin, Terrell, Telfair, Monroe, Wilcox and Haralson as soon as action is taken by the Legislature.

American Soldiers Advocate Good Roads

(Continued from page 90)

the mountains of Tennessee and many other points of great interest over there?

Roads are the clearing houses for the various states and the only means of free travel and much unlike the railways, there is at present little competition or choice of routes. There should be alternative routes between the same terminal points. This competition can never be wasteful because each will serve different districts en route; but this entire system must have a centralized head and a small body of men who are directly responsible for the construction and maintenance of highways in each state, such as France. To do this, it is necessary to have a concerted organized effort. This we do not have. We must have it. Permanent, all the year around highways may be called the normal relation of the modern state to industry.

We are now faced again with a problem for our national prosperity, education and social intercourse, and the immediate future demands that this problem be overcome, and it can only be done by honest legislators, making honest laws, placed in the hands of men who have passed the test, by service in the construction and maintenance of highways. Good roads mean extended prosperity for America.

Road Contracts Awarded in Illinois

Division of Highways Awards Several Large Contracts for Construction on Main Roads

Contracts for the construction of over 100 mi. of road on the Dixie and Lincoln Highways in Illinois have been awarded, according to a recent announcement by S. E. Bradt, State Superintendent of Highways. All of the contracts are for concrete pavements. The locations, the names of the successful bidders and the amounts of the contracts are as follows:

Dixie Highway: Iroquois County: Sections 1, 2 and G-15d, 12.8 mi., Bates & Rogers, Chicago, $310,000; Section 4, 4 mi., Cameron & Joyce Quarry & Construction Co., Koekuk, Ia., $84,191.56; Section H-15d, 1.1 mi., same contractors, $21,632.97; Kankakee County: Section 5, 8.4 mi., Bates & Rogers, $213,990.32; Section 6, 7.2 mi., Chicago Heights Coal Co., Chicago Heights, $134,369.85; Section 7, 6.6 mi., the Embankment Co., Joliet, $144,109.67; Section K-15d, 2.1 mi., Federal Paving Co., Chicago, $46,490.60.

Lincoln Highway: DeKalb County: Sections G, 8 and 18, 5.32 mi., Hart & Page, Rockford, $83,361.58; Section 9, 5.55 mi., A. E. Rutledge, Rockford, $103,837.51; DuPage County: Sections 1, 2 and G, 8.43 mi., Calumet Construction Co., $158,000; DuPage and Kane Counties, Sections 3 and L-15d, 4.93 mi., Hydraulic Stone & Construction Co., Elgin, $103,300; Kane and DeKalb Counties: Sections 4, 5, 6 and 7, 18.48 mi. J. O. Heyworth, Chicago, $363,227.40; Lee County, Section 14, 6.51 mi., C. E. Heaps, Moline, $137,437; Whiteside County, Sections, 15, 17 and H, 13.10 mi., J. J. Dunnegan, Shenandoah, Ia., $280,000.

Besides these contracts, many others have recently been awarded for road work in various parts of the state. These have included many large contracts, among them the following:

Peoria-Springfield Highway, Sections A, O-15d and N, Henry Nelch & Son, Springfield, $143,049.69; Sections C, D and B, Bates & Rogers, Chicago, $442,982.44; Sections E, O, F-15d, F, P, G-15d, H and G, same contractors, $600,000; Section I, Geo. Welch, Beloit, Wis., $127,275.38; Section J, Bates & Rogers, $136,874.76; Sections L-15d and Q, Jensen & Schaeffer, Pekin, $137,862.

Peoria-Henry Highway: Sections B, C and M, Federal Paving Co., Chicago, $218,792.08; Sections G-15d, E and D, Cameron & Joyce Quarry & Construction Co., $108,000.

National Highway: Sections D-15d, A, B and C, J. O. Heyworth, $526,585.52; Sections D, F-15d and E, J. W. Etchison, Casey, $304,780.11; Section F, J. O. Heyworth, $125,412.72; Section G, H. Hays & Son, Janesville, Wis., $85,824.95; Section H, same contractor, $208,729.44.

Dixie Highway, Sections 8, 9, 10 and H-15d, Chicago Heights Coal Co., $252,800.

Federal aid sections, National Highway, Project No. 9: Sections Q and X, Stocker Gravel & Construction Co., Highland, $137,123.50; Section L, Stresenruger & Cotton, Chicago, $113,648.35; Sections O and P, Henry W. Horst Co., Rock Island, $220,606.24; Section F-15d, Van Deusen & Baumberger, Greenville, $105,510.69; Sections 31, G-15d and H-15d, Mautz & Oren, St. Elmo, $168,480.

Cuba's Need of Highways

Letter from an American Resident of Havana Describes Highway Conditions and Urgent Need of Better Highways

A letter from F. S. Phillips, an American living in Havana, Cuba, to Roy D. Chapin, former Chairman of the Highways Transport Committee, is cited by the National Automobile Chamber of Commerce as an instance of the interest aroused in other countries by the movement for the establishment of a national highway system and the creation of a federal highway commission in this country.

Mr. Phillips writes that there is under way a movement looking to the establishment of a complete network of highways connecting different parts of the island and continues:

"From every standpoint—political, social, commercial, etc. —Cuba is fast becoming more closely allied with the United States, and in many ways the interests of the two countries are similiar if not identical.

"Alluring as has been the productiveness of Cuba and the wealth that has resulted from its exports of sugar for the past few years, the fact that the roads of Cuba are very bad has lessened, to a degree difficult to determine, the potential productiveness of the Island.

"From any point of view there is a wholesome interest, or should be, on the part of all those bodies in the United States interested in good roads to assist in such measure as they can, and when opportunity is presented in the extension of the propaganda to and through the Island of Cuba.

"Cuba is bound to become more and more a resort for American tourists; communications between the two countries are bound to become increasingly frequent and adequate. Were Cuba to possess a network of good roads and highways throughout the Island, there seems no question that during the cooler months of the year a great many Americans would come to Cuba and bring their cars for a tour of the Island, and this alone would, besides the other advantages it holds, create a closer bond between the two peoples and a better understanding, one of the other.

"We Americans are all interested in the prosperity of the United States, the increasing value of its manufactures and the greatest possible development of its foreign trade. One very tangible and important element involved in accomplishing these things is cooperation on the part of all those interested in good roads in the States with a nucleus of public spirited and practical men here, Americans and Cubans, who are seeking the best and most practical means and methods to a real beginning of the development of adequate public highways and good roads throughout Cuba.

"The great difficulty, and often impossibility, of intercommunication between towns and cities of the Island unquestionably lessen, to a degree, the commercial development of the country and the volume of merchandise which this country can consume. Likewise, the moving of the products of the country, if facilitated by good roads, would make the purchasing power greater."

Pennsylvania Road Oiling

Work Hindered by Recent Rains, but Is Now 65% Completed—To Be Finished by Aug. 15

While the recent rains have seriously interfered with the Pennsylvania State Highway Department's oiling and resurfacing operations, the work is now 65% completed and it is expected that it will be practically finished by Aug. 15, according to a recent statement from the Department.

During the week of July 26—the date upon which the statement was issued—oiling and resurfacing crews worked in the following localities:

District No. 5, York and Lancaster Counties, Routes 244, 126 and 128; District No. 7, Delaware, Chester, Montgomery and Bucks Counties, Routes 180, 144, 131, 146, 197, 152 and 155; District No. 10, Tioga, Bradford and Lycoming Counties, Routes 21, 308, 287, 15, 20 and 23; District No. 11, Cambria and Somerset Counties, Routes 52 and 119; District No. 13, Allegheny and Westmoreland Counties, Routes 288 and 246; District No. 14, Fayette and Washington Counties, Routes 50, 113 and 246; District No. 15, Erie County, Routes 86, 84 and 87.

Massachusetts Road Laws Passed

Legislature Votes for Annual Expenditure of $1,000,000 for the Coming Four Years and Provides for Several Special Roads

The Massachusetts Legislature, which has recently adjourned, passed a bill authorizing the expenditure of $1,000,000 annually for the next four years for state highways, beginning in 1920, and enacted laws providing for the construction of several special roads.

One of the measures appropriates $20,000 for a highway between the Town of Holden and Wachusett Mountain Reservation, providing the Town of Princetown appropriates $10,000 to be used with the state appropriation. It is also stipulated that the Towns of Holden and Princeton shall assume all land and grade damages and that Worcester County shall repay to the state one-third of the $20,000 appropriation.

Another bill appropriates $10,000 for a highway in the Towns of Holland and Brimfield, one-fourth of the cost to be repaid to the state by Hampden County.

A third bill authorizes the expenditure of $24,000 by the state for the construction of a highway on Prospect St., Leominster, $12,000 to be repaid to the state by the City of Leominster and $6,000 to be repaid by the County of Worcester. This work is made necessary by the closing of a road at Ayer by the military authorities.

The Legislature also passed a resolution calling for a commission to investigate the question of regulating billboards and other advertising devices on public highways, in public places and on private property within the public view.

MEETINGS

Calendar of Coming Meetings

Aug. 13-15.—North Carolina Good Roads Association.—Annual convention, Wrightsville, Beach, Wilmington, N. C. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

Nov. 12-14—American Society of Municipal Improvements.—Annual convention, New Orleans, La. Secretary, Charles Carroll Brown, 304 East Walnut St., Bloomington, Ill.

Feb. 9-13, 1920—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

EQUIPMENT–TRADE–MATERIALS

Changes in Sullivan Machinery Company's Sales Force

The Sullivan Machinery Co., Chicago, Ill., has recently announced several changes in its sales force.

Phillips F. Jarvis has resigned as sales manager for the territory covered by the St. Louis office, and the following appointments have been made:

Marion C. Mitchell has been appointed sales manager for the territory in Indiana and Illinois previously controlled from the St. Louis office, with temporary headquarters in the Railway Exchange, St. Louis. Don M. Sutor, formerly manager of the company's El Paso office, has been appointed sales manager for the territory comprising western Kentucky and Western Tennessee, Missouri, Arkansas, Oklahoma and Kansas (except the oil territory), also with headquarters at the Railway Exchange, St. Louis. Daniel H. Hunter has been appointed sales manager for Louisiana, Texas (except the southwestern section), and the oil fields of Oklahoma and Kansas, with headquarters at Dallas, Texas.

The company believes that this subdivision of the territory formerly covered by Mr. Jarvis will make possible better service than could be given under the previous arrangement.

Fruehauf Trailer Company Buys New Factory Site

The Fruehauf Trailer Co., Detroit, Mich., has purchased a 5-acre tract in that city and is planning the immediate construction of a modern factory.

The new site is situated at Harper Ave. and the Detroit Terminal Railway, about 2 mi. east of the company's present plant on Gratiot Ave. The plans for the building are well under way, and it is hoped that it will be ready for occupancy in the fall. It is expected that these facilities will take care of the company's growth for some time, as the site provides ample space for future expansion.

The Fruehauf Trailer Co. was established about five years ago as an outgrowth of the wagon truck busines of A. C. Fruehauf. Since then its business has grown rapidly and it now manufactures a line of semi-trailers ranging from 2 to 10 tons in capacity and a line of 4-wheeled trailers of capacities from 1½ to 5 tons.

Since the signing of the armistice, there has been an increasing demand from foreign countries and the company reports recent shipments to the Dutch East Indies, Mexico, Cuba, Trinidad, British Guiana and Dutch Guiana.

It is also planned to increase the capital stock of the company from $150,000 to $250,000. The officers are: President, A. C. Fruehauf; Vice President and General Manager, H. C. Fruehauf; Secretary and Sales Manager, E. L. Vosler.

The Osgood Company, Marion, Ohio, manufacturer of excavating machinery, has recently issued a new general catalog. It is 8½x11¼ in. in size and consists of 32 pages and covers. The contents include profusely illustrated descriptions of steam shovels, locomotive cranes, dredges, ditchers and car unloaders. The catalog is printed on heavy paper of exceptionally good quality, with heavy embossed covers.

"Austin Motor Sweeper" is the title of an attractive booklet recently issued by the Austin Manufacturing Co., of Chicago, Ill. It is 9x12 in. in size, consisting of 12 pages and covers, and is devoted to a complete description of the gasoline engine driven sweeper made by the company, with two or three pages given to other road machinery manufactured by the company. It is printed in two colors and is very fully illustrated.

PERSONAL MENTION

Maj. N. P. Turner, formerly county engineer of Harrison County, Texas, has returned from France.

Maj. E. A. Kingsley, formerly paving engineer of the City of San Antonio, Texas, has returned from France.

Harvey Snook, who recently returned from France, has been reappointed county engineer of Sussex County, New Jersey.

Capt. R. Fraser Armstrong, of the Canadian Expeditionary Forces, has been appointed town manager of Woodstock, New Brunswick.

George H. Willits has declined to accept an appointment as assistant county engineer of Dallas County, Texas, note of which was made in this column in the issue of July 16.

H. W. Houghton has resigned from the Engineering Department of the Kansas City Ry. and has entered the employ of the Nebraska State Highway Department as a designer.

Lieut. William L. Stanton, formerly of the 304th Engineers, U. S. A., has resigned from the staff of the city engineer of Flint, Mich., to enter the employ of the Whitehead & Kales Iron Works, Detroit, Mich.

Capt. Harry Tucker has been discharged from the service and has been appointed associate professor of highway engineering at the State College of North Carolina. In this position he will be the head of the department of highway engineering that has recently been established as a part of the civil engineering department.

M. O. Eldridge has resigned from the Bureau of Public Roads, U. S. Department of Agriculture, to become director of roads with the American Automobile Association. For many years Mr. Eldridge was assistant director of the Bureau. More lately he has had charge of the economic, statistical and extension work, as assistant in road economics. He has written many monographs on roads and road work and has delivered many lectures on road subjects. In his new position he will act as secretary of the Good Roads Board of the A. A. A. and as assistant editor of "American Motorist," the association's officials publication.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Rideout Road, Toledo, Ohio. All during 1918 this road was traversed by Army trucks being driven to the Atlantic seaboard. Macadam road resurfaced with "Tarvia-X" in 1913 and treated with "Tarvia-B" in 1916 and 1918.

Total amount invested in this road for 18 years now saved every 10 months!

THIS is Wood County's heaviest traveled road. All automobiles and motor trucks in transit overland around the western end of Lake Erie from Detroit and Toledo to the East must drive over this highway. In fact, most of the overland motor traffic to the South also takes this route.

Mr. John F. Gallier, County Surveyor of Wood County, recently figured that this highway carries 2,000 tons per day for its entire length of 7.36 miles, or more than 5,330,000 ton-miles per year!

This road is a Tarviated highway, and in a very interesting article Mr. Gallier develops the fact that *every ten months* the saving in the cost of operating motor traffic over this highway, as compared with that on a well-drained clay road, *equals the total investment in the road for the past eighteen years.*

Space is too limited to give Mr. Gallier's figures in detail, but a copy of the article, which gives the history and maintenance figures of the road since 1900, will be sent to any interested road engineer or tax-payer upon reqeust.

Briefly, the total investment in the road for 18 years, including three Tarvia treatments, is $99,367.63, or a trifle more than $13,500 per mile.

Figuring carefully and conservatively, Mr. Gallier has worked out the difference in cost of gasoline, tires and oil alone (not taking into account the saving in wear and tear on automobiles and trucks), for traffic over the Tarvia road as compared with the same traffic over a well-drained clay road. Reduced to totals, the figures are:

Total average daily cost of gasoline, tires and oil for motor traffic on clay road................	$714.62
Total average daily cost of gasoline, tires and oil for motor traffic on Tarvia road...............	381.73
Daily difference in favor of Tarvia road...........	$332.89
Difference for 365 days............................	$121,475.85

This means a saving of $10,122.98 per month, or $101,229.80 every 10 months, which is more than the improved road cost to build and maintain for 18 years, including interest, engineering and drainage costs!

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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NEW YORK, AUGUST 20, 1919

Number 8

Asphaltic Pavements at Ashokan

Four-Year-Old Asphaltic Concrete Pavement on 30 Miles of the Highway Around the Ashokan Reservoir of New York's Water Supply System Standing Up Under Heavy Automobile Traffic

By R. R. BARRETT*

In the construction of the Ashokan Reservoir of the New York City water supply system it was necessary to raze eleven villages, move nearly two score cemeteries, relocate approximately 13 mi. of the track of the Ulster & Delaware R. R. and close about 68 mi. of highways. New roads having a total length of about 40 mi. were built to replace those situated in the area flooded, about 34 mi. of the 40 being included in a continuous highway around the reservoir. The method of construction was a deviation from general practice at the time the work was done, and the present excellent condition of the road, now in its fifth year, confirms the judgment of the engineers responsible for its design.

The Ashokan Reservoir is one of the largest reserve supply storage basins in the United States and is situated in the valley of Esopus Creek in Ulster County, New York. Beginning about 6 mi. westerly of the City of Kingston, it extends about 10 mi. towards the base of the Catskill Mountains, lying in the towns of Hurley, Marbletown and Olive. Its construction—an engineering work of the first magni-

COMPLETED BITUMINOUS CONCRETE PAVEMENT AT ASHOKAN RESERVOIR.

---

*Engineer, The Texas Company.

COMPLETED SUB-BASE IN FOREGROUND AND COMPLETED FOUNDATION IN MIDDLE DISTANCE—BITUMINOUS CONCRETE ROAD AT ASHOKAN.

tude—was commenced in 1907 and the building of the roads was completed in 1913 and 1914 towards the completion of work on the reservoir. The grading and the construction of many of the drainage structures on the roads were completed some years earlier, however. A complete account of the construction methods employed in the road work was printed in "Good Roads" at the time it was nearing completion; (see "Road Construction at the Ashokan Reservoir of the New York City Water Supply," "Good Roads," Sept. 5, 1914, page 87.—Ed.)

A total length of about 30 mi. of the 34 consists of asphaltic concrete on a water-bound macadam base, the remaining mileage, comprising chiefly feeder roads, cut-offs and the like, being of water-bound macadam. The portion paved with asphaltic concrete was constructed as follows:

A sub-base consisting of a well compacted rough stone drainage course was laid except where a natural stone sub-base was found. Upon this were laid two 3-in. courses of broken stone passing a 3-in. screen and retained on a 1½-in. screen. Each course was rolled to the specified depth, covered with dry screenings, wetted, and rolled again. This work was kept well ahead of the construction of the top course so that it could be used by traffic for from ten days to two weeks.

METHOD EMPLOYED IN APPLYING ASPHALT CEMENT FOR THE SEAL COAT OF THE BITUMINOUS CONCRETE ROADS AT ASHOKAN.

The wearing surface consists of a 2-in. course of asphaltic concrete having an aggregate of stone passing a 1½-in. screen and retained on a ½-in. screen and designated as "1½-in. run of crusher." The specifications called for from 5 to 7.5% of asphaltic cement, and it was found that 6.25% gave the best results. After the top had been thoroughly compacted by rolling with an 8-ton tandem roller, a seal coat of nearly 1 gal. per square yard of asphaltic cement of the same grade as that used as a binder in the wearing surface was applied in the manner shown in one of the accompanying illustrations. The amount was determined by trial and was slightly more than that called for by the specifications, which was from .5 to .75 gal. per square yard. After the application of the seal coat, ½-in. stone chips were applied in sufficient amount to take up the asphaltic cement, the road was again thoroughly rolled and another light application of stone chips was made.

Native stone was used for both base and top. On some parts of the work it was a hard blue sandstone; on others it varied from red to blue-gray sandstone. Portable crushers and screens were used. For the most efficient screening, the screens were set with 21 in. of ½-in. screen, 36 in. of 1½-in. screen, and the remainder 3-in screen. An auxiliary dust screen was placed around the ½-in. screen when ½-in. stone chips were to be collected. Four asphalt plants were used. The asphalt used for both the wearing surface and the seal coat was Texaco No. 96 paving cement, having a penetration of from 90 to 100 at 77° F. The average total amount used for wearing surface and seal coat was ⅝ gal. per square yard.

Although the country through which the highway passes is mountainous, the maximum grade is 7% and in only a few places does it exceed 5%. The crown was first set at ¼ in. per foot, but was later changed to ⅜ in. per foot.

The consulting engineers on the highway work were A. H. Blanchard and Geo. W. Tillson. The contractor was the State Highway Construction Co. and the sub-contractor for the asphaltic concrete work was the Continental Public Works Co., both of New York, N. Y.

Ohio Work to Cost $17,000,000

Present Program Calls for Building of Approximately 600 Miles of New Highway

Ohio's road improvement program for 1919 calls for the expenditure of approximately $17,000,000 for the building of about 600 mi. of road, according to a recent announcement by State Highway Commissioner Cowen.

Previous to the letting of Aug. 5, which covered 155 mi. of highway, contracts awarded since the first of the year had involved 334 mi. of road at a cost of $9,249,635. The estimated cost of the work included in the letting of the 5th, was $4,268,155. It included a stretch of 16.5 mi. on the Akron-Cleveland Road, 5 mi. on the Columbus-Washington C. H. Road in Fayette County, 5 mi. on the Columbus-Wooster Road in Knox County, 10 mi. in Darke County, 12 mi. in Hamilton County, 9 mi. in Portage County, 9 mi. in Shelby County, 8 mi. in Wood County and 6 mi. in Mercer County.

◆

Applications for Contract Bonds are Increasing, according to an official of one of the large bonding companies, a large percentage of them being for road work. A notable feature of the applications is that numbers of them are from contractors who have previously been engaged in other kinds of work, but are turning their organizations temporarily to road work.

Highway Maintenance in Wisconson—II*

Earth Road Maintenance—Good Grading and Drainage Essential to Adequate Upkeep—The Use of Graders—Drags and Dragging

To maintain an earth road so that it will adequately take care of heavy traffic, it is essential, first, that no water be allowed to stand on the road surface or in the ditches, and second, that defects occurring in the surface be repaired immediately and in a manner that will form a crust sufficient to maintain the loads and resist the wear caused by traffic.

The first can be accompanied only by grading and draining the road in a manner that will permit water to drain quickly from the surface after each rain; the second, by adding clay or sand in the proper proportions as required, shaping up the surface with a light grader and keeping the traveled surface smooth and even with the road planer, after which the earth surface eventually becomes smooth and impervious to water. The result is an extremely satisfactory road at a very low cost to the public.

Additional Drainage.—It is necessary at times for the patrolman to open up ditches along intersecting roads to carry the excess water away from his section to some nearby stream or dry run, or even to open up ditches through private property to produce the same results. This work is properly a part of the patrolman's duties; and, where necessary to enter private property for such purposes, the patrolman must take the matter up with the owner, who, in the majority of cases, gives permission freely if approached in the proper manner.

Culverts and Drain Tile.—The patrolman must keep all drainage structures in good repair and free and open so that there may be no impediment to the flow of water. His first job in the spring is the thorough opening and cleaning out of all culverts and outlets of drain tile. It must also be his last job in the fall just before going into winter quarters, and it is necessary several times during the maintenance season. The filling up and stoppage of culverts causes more damage to road surfaces than any other one thing.

Grader Specifications.—The best single tool for use on earth road maintenance is the light blade grader. The ideal grader for patrol maintenance is one strong enough to stand the required strain when pulled by four horses in cleaning out ditches and other necessary work that is too heavy for two horses, and yet light enough and so constructed that the draft will be such that two horses can easily pull it when doing ordinary patrol grader work. The following specifications meet the approval of the Highway Commission and practically all county highway commissioners and patrolmen:

1. The wheel-base should be from 108 to 120 in.

2. The front wheels should be not less than 24 in. in diameter and the rear wheels not less than 30 in., with 3-in. tires. Flanges are not required on patrol grader wheels.

3. The wheels should be so constructed that grease can easily be forced over the entire length of the skein without removing the wheel. Roller bearings are recommended.

4. The blade should be from 60 to 72 in. in length and hung from the frame at a point equidistant from the front and rear axles. This is very important to insure a surface free from waves or undulations.

5. A positive raising and lowering device must be provided. The blade must stay where placed without the patrolman being compelled to hold the raising and lowering wheel or lever in the desired position.

6. The grader should be equipped with a roomy tool box securely fastened to the frame.

7. The desired weight is from 1,000 to 1,400 lb. We realize that a light grader built according to the above specifications must sell for more money than many of the cheaper light graders, but we know that it will be worth the difference in cost.

Remember that "what you pay for what you get" is of less importance than "what you get for what you pay."

Light Grader Work.—The majority of earth roads have been previously graded and it is necessary to clean out the ditches and true up the crown of the road by the use of the light grader two or three times each season. This work requires four houres and the patrolman charges the extra team hire to the special fund allotted to his section by the county for "extra work."

If grass or weeds cover the shoulders and ditches, remove them by cutting them away from the edge of the road with a good sharp grader blade, cutting just deep enough to remove the crown of the grass roots. When cut away, remove the grass and weeds and, if possible, use them at some point in the patrol section to prevent the side banks or fills from washing.

The center of an earth road dries more quickly after a rain than do the sides; therefore, the patrolman's first round trip over the road with a grader after each rain is on the center with the blade set at an angle that will move the surplus dirt ahead and out. This method smooths up the center first, where the traffic should travel and wishes to travel. Do not attempt using the grader after a rain until the earth is dry enough to move freely along the grader blade. After the center is smoothed up, begin at the ditch line and work towards the center of the road, cutting very lightly, with the blade of the grader set at the proper angle to allow the dirt to move freely along the blade towards the center of the road.

Make as many round trips as are required to bring the surface to the proper crown, and exercise great care or an excessive crown will be had at certain places.

Where an excessive amount of material is brought up from the ditches so that it tends to raise the center of the road too high at that particular point, move the surplus material ahead to some low point by the use of the slip scraper and spread it out evenly.

About October 15th to November 1st, each year, cut the grass and weeds away from the shoulders of the road with a grader, leaving them bare upon entering the winter season. This permits the frost to thaw out at the same time in the spring in the road shoulders that it does in the center of the road, thereby permitting proper drainage from the center of the road to the ditches.

Where a mat of grass and weeds is allowed to remain on the road shoulders, the frost remains in the shoulders several days after it has thawed out within the limits of the traveled way. The result on heavy clay soils when such conditions exist is sure to be a sea of mud the entire length of the road.

Frequently it is necessary to cut the earth away from the center of the road to avoid an excessive crown, as continued grading and planing towards the center, together with the pounding down of the shoulders by the traffic, has a tendency to increase the crown.

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*From "Highway Maintenance," Bulletin No. 8, Wisconsin Highway Commission, a publication devoted especially to patrol maintenance on the state highway system, compiled by J. T. Donaghey, Maintenance Engineer.

It is advisable to reverse the direction of operating the light grader frequently. This removes any wavy appearance that has been brought about by the grader blade dipping in or the wheels passing over some object in the roadway, and results in a more uniform crown.

Do not leave a ridge of earth or sod in the center of the road.

Have the entire cross-section of the road conform to the standard maintenance cross-section.

Road Drag; Type of Drag.—There are numerous types of steel road drags on the market, which will do the work equally well if properly handled. However, the old split log drag will produce results as good as, if not better than, those that can be obtained by the use of any of the more modern and more costly types of drags.

The light grader is fast replacing the road drag, because when properly handled it will produce better results with less horse power.

When to Drag.—The proper time to drag a heavy clay road is after a rain or a wet spell, when the earth is just dry enough to move freely, compact readily, and not rut too easily from the traffic following the drag. Do not attempt to drag a heavy clay road when it is either too wet or too dry. Dragging may be done more quickly after a rain on light clay or loam sections, than on heavy clay soil. On sandy soil, the drag is always used while the surface is quite wet. While the earth is yet moist it moves more easily and the drag has a smearing effect, closing the pores of the earth and eventually making the surface impervious to water. Dragging a slushy road is beneficial, if done immediately preceding the annual freeze-up.

An excellent time to get results with the road drag is after the ground has frozen up in the early winter. When a bright sunshiny day appears and softens up the high points of the frozen surface, the drag will remove the sharp points to the low places and leave the surface in excellent condition.

The drag is also used at certain times during the winter months. If there happens to be no snow or if a thaw occurs, removing the snow from the road surface, the drag should be used whenever the surface is softened up to such an extent that it may be smoothed up by its use.

Be sure and use the drag just as the frost is coming out in the spring. In many seasons, if a drag is used just as soon as possible, even though the frost is not entirely out of the road surface, excellent results are obtained. The surface is smoothed up and side drainage provided which carries off immediately the rains that are sure to follow, thus avoiding the bad conditions generally existing during the annual spring break-up.

How to Drag.—The drag should not be moved faster than a reasonable walk and can be hauled under ordinary conditions with two good heavy horses. The main object is to even up to the surface and fill the low places. The hitch must be so arranged that the surplus earth is moved ahead and dropped in the low places. Only enough loose earth should be moved toward the center to fill the ruts and depressions. An excessive crown or surplus loose earth in the center of the traveled way must be avoided. The center should be the very smoothest portion when completed.

Dragging should begin on the center line of the road moving the surplus earth out in order to maintain the proper crown.

A crown of more than 6 in. on a 24-ft. width of traveled way will tend to force the travel to the shoulders in dry weather and to the center in wet weather, each of which is detrimental to the road surface. The less crown given an earth road, provided it insures good drainage from the center of the road to the ditches, the cheaper and easier it is to maintain the surface.

The driver rides the drag. By shifting his weight ahead, the drag cuts deeper, and by shifting his weight back, it cuts lighter. When dragging from the ditch towards the center of the road, shifting his weight towards the road has a tendency to drop material, and away from the road will carry material ahead.

The weight of the road drag plus the weight of the driver is carried on the cutting blades. This has a tendency to form undulations or waves at frequent intervals, due to the difference in the character of the earth surface. These are very disagreeable and difficult to remove, and this is the glaring objection to the use of the common road drag. The undulations formed may be removed either by use of the light grader or road planer.

Government to Act Against Cement Manufacturers

Nineteen Eastern Cement Companies Are Charged with Unfair Practices

Attorney General Palmer has instructed United States District Attorney Bodine, of Trenton, N. J., to commence action against nineteen eastern cement manufacturers on the ground that they "have been and are engaged in a combination and conspiracy in restraint of interstate trade and commerce in Portland cement."

The Department of Justice alleges that from 1905 until 1911, the defendants were organized as the Association of Licensed Cement Manufacturers, the purpose of which was to license members to manufacture Portland cement and to enforce selling it at certain prices, including freight, that were uniform at given points of delivery. Although, as a result of a court action in 1912, the licensing system was abandoned, the defendants "continued to consider it regular for all to make the same price at any given point of delivery, regardless of differences among them in costs of production and in freight rates from their mills to the point of delivery, and for all to adhere to the prices made by the defendants doing the largest business," according to the Department. It is also charged that the defendants reduced their output and continued to maintain an association, the expenses of which were borne by the member companies in accordance with their volumes of business, and that its purpose and effect was to restrict the amount of cement produced, to reduce the amount subject to future delivery, to maintain uniform prices at given delivery points, and to increase prices.

The companies affected are given as follows: Atlas Portland Cement Co., Allentown Portland Cement Co., Alpha Portland Cement Co., Bath Portland Cement Co., Coplay Portland Cement Co., Dexter Portland Cement Co., Edison Portland Cement Co., Giant Portland Cement Co., Glens Falls Portland Cement Co., Hercules Cement Corp., Knickerbocker Portland Cement Co. Lawrence Cement Co., Lehigh Portland Cement Co., Nazareth Portland Cement Co., Penn-Allen Cement Co., Pennsylvania Portland Cement Co., Phoenix Portland Cement Co., Security Cement & Lime Co., Vulcanite Portland Cement Co.

Work on Roads Connecting Charleston, Mo., with Bird's Point, opposite Cairo, Ill., will be commenced in the near future, according to a recent announcement. The new road will be of cement concrete, 15 mi. long and 16 ft. in width. It will cost about $400,000 and will be the first section of a concrete paved road extending westerly to Poplar Bluff, Mo., with branches to Sikeston and New Madrid.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
Editor

T. A. HULBERT
Managing Editor

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Cable Address: Gudrodes, New York

Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIII **August 20, 1919** **No. 8**

MOTOR HAULING FOR FARMERS

Food prices are perhaps of more general interest just at present than any other matter that engages the attention of the average citizen. Everybody realizes that they are high—higher than seems warranted by the normal operation of the law of supply and demand—but it is not so generally understood that, leaving profiteering and similar considerations out of the question, one of the chief causes is defective distribution. Which is another way of saying that our transportation facilities are inadequate.

A large part of the foodstuffs used is transported by rail, besides being carried over the roads from the farms and fields to the shipping point and again over the highways to the wholesalers and retailers. These hauls make the freight or express charges a large percentage of the total cost, so that reducing transportation charges is one very effective way of bringing down food prices. The motor truck provides two ways of accomplishing this: First by reducing hauling costs at each end of the rail haul, and second, by eliminating the rail haul in those cases where producer and consumer are not widely separated.

The first method is being utilized more and more through the farmer's use of trucks to bring his produce to market. In many cases the farmer owns his own truck and in many others, especially among farmers whose hauling is not of enough volume to warrant the investment required for a truck, it is handled by highway transportation companies. In a few instances, as exemplified by the situation in Harford County, Maryland, to which attention has been called previously, farmers have banded together to take care of their haulage problems.

The second method is also being used to a very considerable extent, though much greater use is possible and is sure to come. Under present distributing conditions, it is quite common to find that large supplies of foodstuffs are wasted within short distances of good markets, because there is no means for bringing them in. Consumers in cities pay high prices for fruits and vegetables brought hundreds of miles over the railroads when equally good produce is going to waste within relatively short distances, because the nearby producers have no means of marketing what they grow.

The use of motor trucks by farmers, individually and in cooperative organizations, and the extension of rural motor express lines radiating out from market centers can and will do much to establish better connections between producers and consumers and thus lower the burdensome food prices that are now being exacted.

THE ROADS AT ASHOKAN

The satisfactory service rendered by the asphaltic macadam roads at the Ashokan reservoir of the New York City water supply demonstrates several points that may well be emphasized.

In the first place, it shows that highway engineers are quite capable of designing and constructing suitable roads when they are allowed to proceed without reference to anything except the engineering aspects of the problem.

In the second place it shows that under certain conditions a broken stone foundation, properly constructed upon the right sort of subgrade, meets every requirement of heavy automobile traffic.

It also shows that a properly drained and compacted subgrade, reinforced with stone, where necessary, is well worth its cost.

An article on other pages of this issue contains a brief description of the construction methods followed in the building of these roads, and in it reference is made to a more detailed account of the work printed some years ago when it was under way.

Although the construction of the roads was incidental to the main undertaking, the building of the reservoir, it was studied very carefully by the engineers of the Board of Water Supply and by the specialists associated with them as consultants. Many types were considered and the final selection was made only after a very thorough canvass of the experiences of other engineers with standard types and with deviations from accepted practice. That the roads were eventually built on designs departing more or less from the practice commonly prevailing at that time is an indication of the painstaking investigation that has been justified by the results.

In adopting a broken stone foundation course the builders displayed confidence both in their belief in its adequacy and in their ability to secure good workmanship. While many engineers believe that broken stone foundations have sufficient strength for heavy-traffic roads and possess marked advantages under certain conditions, they are equally alive to the fact that the adequacy of such foundations depends upon using them only where conditions are right and where proper construction methods can be enforced.

The engineers on the Ashokan work had an unusual opportunity to secure a properly drained and compacted subgrade, because the main job was one requiring several years for completion and, therefore, giving ample time for the performance of incidental work. Because of this, they were able to grade some of the roads more than a year before commencing work on the surfacing. This permitted the fills to settle thoroughly and gave time for the development and remedying of drainage difficulties.

To a very large extent, every road improvement job is a problem of itself and is not to be solved by a blind adoption of methods proven successful on some other piece of work. The Ashokan roads do not indicate that asphaltic concrete surfaces are the kind to be selected for all cases nor that broken stone foundations are universally satisfactory under asphaltic concrete or macadam or other wearing surfaces. At the same time, any piece of road work, whether successful or unsuccessful, can be used as a demonstration of what to do or what not to do, provided that it is possible to obtain sufficient knowledge of the conditions encountered and the methods adopted. The Ashokan roads are a case in point.

More New York Road Bonds Proposed

Next Legislature Will Probably Be Asked to Authorize Referendum on $100,000,000 Issue, According to Highway Commissioner Greene

Another bond issue for the improvement and construction of New York roads will probably be asked of the next Legislature of that state, according to a recent statement by Frederick S. Greene, State Commissioner of Highways.

It is proposed to ask the Legislature to authorize a referendum on a $100,000,000 issue, the proceeds to be spent as appropriated at subsequent sessions of the Legislature. The Board of Supervisors of Wayne County has already passed resolutions favoring such action. Commissioner Greene, in discussing the proposal, said:

"Of course, it is not conceivable that after the 13,000 mi. of improved highways now called for are completed this great state will stop building roads. It is economically necessary for us to continue to meet all federal aid appropriations, even if we do no more. No one doubts that after 1921 there will be further federal aid appropriations, so we could not stop highway construction without losing our portion of this federal money. In view of this, I believe it is better to go to the people once for a large bond issue than to go to them from time to time for several small ones.

"It should be remembered that asking for a bond issue of $100,000,000 does not mean that all of this money is to be raised immediately, for it could not be spent immediately. As with former referendums, the money to be spent must be appropriated by the Legislature as needed and when it can be wisely spent."

Road Surveying in Missouri

Six Surveying Parties of Ten Men Each Organized by State Highway Department

The Missouri State Highway Department has organized six surveying parties of ten men each to commence the work of surveying the first 6,000 mi. of highways that are to be improved. The parties are under the supervision of the division engineers of the department, and work is to be commenced in the near future.

"The survey parties will take care of the counties that are not able or willing to handle their road surveying themselves," said John M. Malang, Superintendent of Roads, in announcing the formation of the parties. "Under the new road law counties may contract with private engineering firms to do the required surveying if they do not wish to wait for the regular state highway surveyors. But if the work is done by private concerns it must meet the approval of State Highway Engineer Graham and Federal Resident Engineer Lotter.

"No road can be approved for federal or state aid unless it is properly surveyed under the regulation of the State and Federal Governments. The task of surveying 6,000 mi. of road is so great that the State Highway Department is anxious that, if possible, the counties handle the work themselves under competent engineers. No more than $100 per mile is allowed under the new law for surveying the two highways in each county designated as state roads, and this cost is deducted from the $1,200 per mile allowance for each county.

"The State Highway Department is anxious to get the details of surveying out of the way in order that federal projects may be passed upon speedily and that road work may commence at an early date. In order to be in a position to get their share of the federal and state aid, and to avoid the rush that is coming when the $30,000,000 bond issues are voted, counties are urged to speed up on the required surveying."

Alabama May Bond for $25,000,000

State Senate Votes Overwhelmingly to Submit Bond Issue Question to People

With only one dissenting vote, the Senate of the Alabama Legislature has voted to submit to the people of the state the question of a $25,000,000 road bond issue.

The bill directs the governor to call an election within 90 days of the final adjournment of the Legislature to decide whether or not the state constitution shall be so changed as to permit the issue. It is proposed to pay the interest from the proceeds of the automobile and vehicle tax.

Massachusetts Department of Public Works Supersedes Highway Commission

New Law Consolidating About One Hundred State Departments Into Twenty Abolishes Highway Commission—Road Work of Future To Be Under Department of Public Works

One of the last acts passed by the Massachusetts Legislature of 1919 provides for twenty state departments to replace about one hundred now in existence. The new law becomes effective on Dec. 1, and one of the departments affected is the State Highway Department, which has been in existence since 1893.

The new law abolishes the Massachusetts Highway Commission and the Commission on Waterways and Public Lands and transfers their functions to a new department to be known as the Department of Public Works. This new body will be under the control of a commissioner and four associate commissioners appointed by the Governor for 3-year terms. When the first appointments are made the governor is to designate two associate commissioners to have charge of a division of highways and two associate commissioners to have charge of a division of waterways and public lands. The commissioner is empowered to act as a member of both divisions and, when present at meetings of either division, to act as chairman. The commissioner's salary is fixed at a maximum of $7,500 annually, and associate commissioners' salaries at a maximum of $6,000 each.

The law authorizes the commissioner to appoint a registrar of motor vehicles and to fix his salary. This official is to exercise the authority now vested in the Highway Commission as to the suspension and revocation of licenses.

The Transcontinental Truck Convoy of the Motor Transport Corps was received at Chicago Heights, Ill., by a special committee made up of representatives from the Associated Roads Organizations of Chicago and Cook County, the Chicago Automobile Trade Association, the Chicago Motor Club, the Illinois State Automobile Association, the Chicago division of the Touring Club of America, the Lincoln Highway Association and several other organizations.

Who's Who for Good Roads

Men Prominently Identified with Highway Development

From time to time we print on this page biographical sketches of the men who build the country's roads and the men who develop highway transportation—men who as a class are playing a most important part in the making of the nation. It is our hope that these brief sketches and the portraits will serve to bring closer together the earnest workers all over the country who are devoting their lives to this great work.

C. C. Cottrell

State Highway Engineer of Nevada

C. C. Cottrell, State Highway Engineer of Nevada, was born at Auburn, Neb., Dec. 31, 1885, and received his education in the public schools of that place and at the University of Nebraska. During 1906 and 1907, while attending the University, he was in charge of the construction of a water-bound macadam road in eastern Nebraska, built under the direction of the U. S. Office of Public Roads, as a model highway.

From 1909 until the summer of 1913, Mr. Cottrell was engaged in private practice at Portland, Ore. During that period he was connected with various power and irrigation projects in the Northwest and with street improvement work, both as an engineer and a contractor. From July, 1913, until June, 1917, he was with the San Francisco Division of the California Highway Commission, first as superintendent of construction and later as superintendent of maintenance.

Upon the organization of the Nevada Highway Department in June, 1917, he was appointed assistant state highway engineer and served in that capacity until January, 1918, when he was appointed state highway engineer to succeed R. K. West, resigned.

Mr. Cottrell is a member of the American Association of State Highway Officials and an associate member of the American Society of Civil Engineers.

C. C. COTTRELL.

M. W. Watson

State Highway Engineer of Kansas

M. W. Watson, State Highway Engineer of Kansas, was born April 30, 1890, at Racine, Ohio. He was educated in the public schools of that place and at the Ohio University where he graduated from the civil engineering course in 1911.

During the summers of 1909 and 1910, Mr. Watson was engaged in mining, railroad and general engineering work in southeastern Ohio. He was employed in the same work from his graduation until September, 1911, when he entered the employ of the United States Engineers' Office at Louisville, Ky., on the Ohio River improvement. He remained at this work until May 31, 1912, when he went to the Illinois State Highway Commission as a junior engineer. He was later made assistant engineer to the road engineer and had charge of the preparation of plans, surveys and estimates.

In May, 1917, he was appointed road engineer of the Kansas Highway Commission where he was in direct charge of all road work under the supervision of the State Highway Commission. From July 15, 1918, until June 4, 1919, he served as acting state highway engineer of Kansas, taking the place of former State Highway Engineer W. S. Gearhart, who had been given leave of absence to enter the United States service. Upon Mr. Gearhart's resignation on June 4 of this year, Mr. Watson was appointed highway engineer.

M. W. WATSON.

Rollen J. Windrow

State Highway Engineer of Texas

Rollen J. Windrow, State Highway Engineer of Texas, was born in San Saba County, Texas, June 9, 1885. He received his education in the schools at Temple, Texas, the San Angelo High School and the Agricultural and Mechanical College of Texas.

Mr. Windrow graduated from the civil engineering course at the Agricultural and Mechanical College in 1906 and worked until December of that year as a surveyor on levee and revetment work on the Mississippi River for the United States War Department. From December, 1906, until June, 1908, he was an instrumentman and resident engineer for the Gulf-Colorado & Santa Fe Railway Co. on maintenance of way in Louisiana. From June until December, 1908, he was a resident engineer for the Texas Central Railway, with headquarters at Waco, Texas, but in December returned to the Santa Fe to become a resident engineer with headquarters at Tenaha, Texas. He remained here until August, 1909, when he was transferred to the Sterling City Branch and Lometa Extension.

Mr. Windrow resigned from the Santa Fe to become an instructor in civil engineering at the Agricultural and Mechanical College of Texas, where he remained until June, 1912, at which time he was awarded the degree of C. E. During the summer of 1912 he was bridge designer for the Chicago, Milwaukee & Saint Paul Railroad Co., at Chicago, Ill. The next year he returned to Texas to become county engineer of McLennan County, in which position he served from June, 1913, until November, 1917. During that time he supervised the construction and maintenance of about $1,500,000 worth of highway work. In November, 1917, he was elected a member of the Board of Water Engineers of Texas but resigned in January, 1918, to become city engineer and manager of Waco. In March, 1918, he entered private practice as an engineer and contractor at Waco and continued in that work until he succeeded Geo. A. Duren as state highway engineer of Texas in May of this year.

R. J. WINDROW.

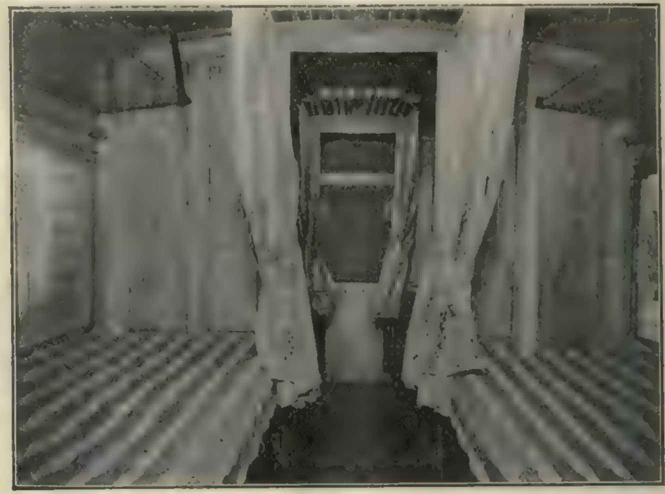
HIGHWAY TRANSPORTATION

Cross-Country Business and Pleasure Trip by Motor Truck

President C. G. Barley, of Indiana Truck Corporation, Making Camping Trip in the "Helomido," Indiana Good Roads Booster

A combined business and pleasure trip is being made in an especially equipped Indiana truck by C. G. Barley, President of the Indiana Truck Corporation, Mrs. Barley, Mr. and Mrs. Harry Goldthwaite, and a driver. The party left Marion, Ind., on Aug. 10 and will go to the Pacific Coast, taking about two months for the trip, which, Mr. Barley writes, was undertaken "largely for the purpose of creating an interest in good roads."

The truck, the "Helomido," is shown in one of the accompanying illustrations. It consists of an Indiana 2½-ton chassis, standard except for the wheel-base which is 186 in., and a special body. It is 30 ft. long, 6 ft. wide and 9 ft. 6 in. high, and weighs slightly over 7 tons, including driver, passengers, gasoline, water and supplies. The body has two compartments, each accommodating two persons, and a third compartment for the lavatory and toilet. The front seat is so built that the driver can sleep on it in a sleeping bag. The machine is driven by a 55 hp. Ruterber motor and is equipped with a Westinghouse starting and lighting system. In addition, it has a separate Delco 20-watt lighting system for the inside of the car and the camp, and a Delco pumping system to furnish water under pressure for various purposes and to pump water from springs and other outside sources up to 50 ft. distant. The truck is equipped with Firestone pneumatic cord tires, those on the rear wheels being 42x9 in.


INTERIOR VIEW OF SLEEPING COMPARTMENT OF THE "HELOMIDO."

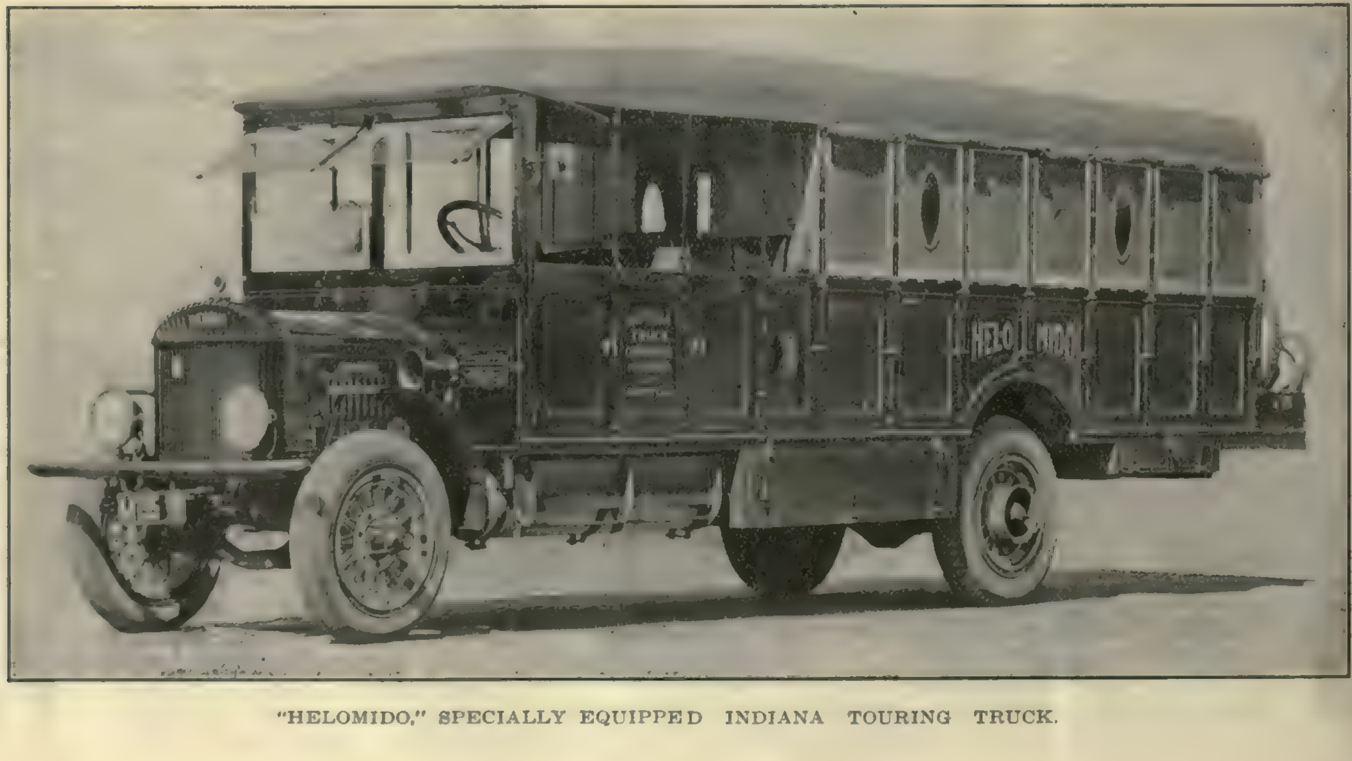
The car is furnished with every convenience for camping. There is a built-in ice chest having a capacity of 100 lb. of ice and enough food for five people for a week. A 15-ft. balloon silk fly is carried for use either as a fly or a tent. It can be attached to the side of the car and is used as a cook tent. The car is also furnished with a complete camping outfit which includes a wood and a gasoline stove and a set of aluminum utensils. Wearing apparel and other supplies are carried in lockers under the seats and boxes fastened under the car contain tools and other supplies.

Missouri Governor on Good Roads

Building of Good Roads and Use of Motor Truck Promise of Tremendous Advancement

The practicability of motor truck transportation and the importance of building good roads were emphasized by Governor Crossley, of Missouri, in a recent address delivered at the Missouri State Fair. He said, in part:

"If we had good roads all over Missouri, there would be



"HELOMIDO," SPECIALLY EQUIPPED INDIANA TOURING TRUCK.

no terror in the thought of suspension of railroad traffic. Motor trucks would serve every essential purpose of carrying supplies.

"The people of Missouri, especially those living along the highways and in communities through which motor trucks pass regularly, are manifesting great interest and enthusiasm in the progress of good roads in Missouri and in the great possibilities and advantages in truck transportation systems.

"The use of the motor truck in solving the question of rapid transit on short hauls is no longer an experiment, and we shall soon see the truck serving the farmer and the business interests of the small town just as it is being used in the larger cities. With good roads and motor trucks, we shall not have to depend solely upon the railroads; and when transportation tie-ups come, as is now threatened, supplies can go from country to city or from city to country. The projection of good road building and extended use of motor trucks is a great movement and a promise of tremendous advancement."

Unusual Demand for Motor Cars

Official of Kissel Motor Car Co. Foresees Record Breaking Sales for Next Two Years

There is no doubt that the last half of the present year will be a period of record breaking sales of automobiles, in the opinion of G. C. Frey, of the Kissel Motor Car Co. In a recent statement he said, in part:

"Right now, during the month of August, there are more than 6,000,000 cars on the good, bad and indifferent roads of the United States. Thousands of farmers who have never enjoyed the benefits from owning an automobile have now ordered their first cars. Those farmers who have owned cars before are now dissatisfied unless they own a second car, besides the one they use for business, and that means a limousine or closed car.

"It is becoming more apparent every day that the year of 1919 and 1920 will see all records broken in the automobile and motor truck industry. The value of farm products alone is estimated at $25,000,000,000. In every industry the total business for the year will far exceed any totals of previous years. And it is being spent on that which every man and woman has wanted for years past—an automobile. According to practical authorities, I understand, it is estimated that the present increased buying of automobiles and motor trucks will continue for at least two years before a normal demand sets in."

Recent Changes in Personnel of the Highways Transport Committee

Departments of Agriculture, Interior and War Appoint New Representatives

The Highways Transport Committee of the Council of National Defense has recently announced the appointment of new representatives from the Departments of Agriculture, the Interior and War.

Clifford Shoemaker has been appointed by Secretary Houston to represent the Department of Agriculture. Mr. Shoemaker succeeds John M. Goodell, whose resignation from the committee follows his retirement as consulting engineer in the Bureau of Public Roads.

John W. Halowell, Assistant to the Secretary of the Interior, has been appointed to represent that department on the Committee, and Lieut. Col. J. M. Richie has been selected by Secretary Baker as the representative of the War Department. His appointment was noted in "Good Roads" for Aug. 6.

The representatives of the various executive branches of the Government now on the Committee are as follows:

Lieut. Col. J. M. Richie, Motor Transport Corps, War Department; James I. Blakslee, Fourth Assistant Postmaster General, Post Office Department; John W. Halowell, Assistant to the Secretary, Department of the Interior; James H. Collins, Investigator in Market Survey, Bureau of Markets, and Clifford Shoemaker, Bureau of Public Roads, Department of Agriculture; Dr. R. S. McElwee, Assistant Director, Bureau of Foreign and Domestic Commerce, Department of Commerce.

New York State Highways Transport Committee Appointed

Governor Smith, of New York, has appointed a state highways transport committee, as recommended in a recent report by the Reconstruction Commission of the State of New York. Note of this report was made in "Good Roads" for July 30, and the full text of the report was printed in the issue of Aug. 6.

The chairman of the committee is Peter G. Ten Eyck, a former member of Congress and the former regional chairman for District No. 2, of the Highways Transport Committee of the Council of National Defense. The other members are Capt. Frederick S. Greene, State Commissioner of Highways; James E. Boyle, Extension Professor of Rural Economy, College of Agriculture, Cornell University; F. W. Fenn, Secretary of the Motor Truck Committee of the National Automobile Chamber of Commerce, and William E. Dana, Chairman of the Council of Farms and Markets.

Highways Transport Committee Announces Plans

Formal Statement of Policy Contained in a Resolution Adopted at Meeting in July

At a meeting of the Highways Transport Committee of the Council of National Defense, held in July, there was adopted the following statement of the committee's policy in formulating its peace-time program:

"The Highways Transport Committee of the Council of National Defense believes that in order to promote the best results in the increase of the value of land, the increase of production, the increase of distribution of merchandise and commodities, adequate highway transportation should be provided through territories not served by rail, electric or water transportation.

"The Committee appreciates the fact that commercial highway transportation on any of the main traveled highways of the country is valuable in that it provides connection between large industrial centers, and in providing that transportation which is necessary to the health, comfort and pleasure of the community. Yet the committee believes that such transportation is of questionable value in the encouragement of commerce when running immediately adjacent to rail and waterways between terminals and, therefore, presumably in direct competition with such facilities.

"The Committee recognizes the economic disadvantages suffered by the individual producer who lives at a distance from adequate available transportation facilities and the Committee also believes that development of the country will be far more rapid when there is efficient rail or other transportation in territories not so supplied at the present time.

"In other words, the Committee is becoming more and more convinced that the development of efficient rail, electric and water facilities is dependent upon the establishment of highway transportation facilities in territories such as will prove complementary to such rail, electric and waterway systems, instead of competing with them."

MEETINGS

Calendar of Coming Meetings

Nov. 12-14—American Society of Municipal Improvements. —Annual convention, New Orleans, La. Secretary, Charles Carroll Brown, 304 East Walnut St., Bloomington, Ill.

Feb. 9-13, 1920—American Road Builders' Association— Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

PERSONAL MENTION

The Dappert War Record

Among the fine war records made by American engineers none is finer than that of the family of J. W. Dappert, of Taylorville, Ill.

Mr. Dappert, who is the president of the Illinois Society of Engineers, maintains a general consulting practice. He gave five sons and a daughter to his country and with the help of another daughter kept his work going until the end of the war.

One son, Lieut. J. Ivan Dappert, Company K, 132d Infantry, was killed in action near Albert, France, on Aug. 11, 1918. Capt. Merlin L. Dappert, of the 130th Infantry, Lieut. Anselmo E. Dappert, of the Heavy Tank Corps, and Sgt. Boyd H. Dappert, of the 306th Engineers, have been discharged. The fifth son, Lieut. John V. Dappert is in a hospital in Chicago recovering from injuries to his eyes resulting from being gassed during the Meuse-Argonne offensive.

The daughter, Lucy C. Dappert, who was in the War Risk Insurance Bureau during the war, has returned to her work as bookkeeper for her father.

Sergeant Boyd H. Dappert is county surveyor of Christian County, Illinois.

T. H. Johnson has resigned as city engineer of Sioux City, Ia.

H. E. Bell has resigned as county engineer of Coryell County, Texas.

R. S. Fisher has been appointed county engineer of Taylor County, Texas.

Judge R. B. Cross has been appointed county engineer of Coryell County, Texas.

George F. Cotterill has resigned as chief engineer of the State Highway Department of Washington.

J. C. Townley, formerly superintendent of public works of Ithaca, N. Y., has been discharged from the service and been appointed an assistant engineer with Hugh L. Cooper & Co., hydro-electric engineers, New York, N. Y.

Prevost Hubbard has resigned as chief of the Division of Tests and Research of the United States Bureau of Public Roads to become chemical engineer for the Asphalt Association, with headquarters at 15 Maiden Lane, New York, N. Y. Mr. Hubbard has been connected with the Bureau of Public Roads for a number of years and is a very well known authority on bituminous road materials and their use.

T. A. Garrow has resigned as city engineer of The Dalles, Ore.

Herbert Schroeder has been appointed highway engineer of Blanco County, Texas.

J. G. Rollins, of Merritt, Texas, has been appointed highway engineer of Webb County.

A. M. Schott has been named acting city engineer of Sioux City, Ia., vice T. H. Johnson, resigned.

Capt. Henry Porter has returned from France. During his absence overseas he was elected highway engineer of Kleburg County, Texas.

Capt. H. R. F. Helland, formerly city engineer of Paris, Texas, has returned from France and has been appointed city engineer of Waxahatchie.

Blair Boil has resigned as county engineer of Geary County, Kansas, and has been appointed county engineer of Bourbon County, Kansas.

H. A. Stevens has been appointed highway engineer of Nueces County, Texas. Mr. Stevens has been city engineer of Corpus Christi for the past six years.

A. D. Duck, County Engineer of Hunt County, Texas, and Capt. A. D. Stivers have organized the firm of Duck & Stivers, consulting engineers, at Greenville, Texas.

Capt. A. D. Stivers, formerly city engineer of Pittsburg, Texas, and A. D. Duck have established the firm of Duck & Stivers, consulting engineers, with offices at Greenville, Texas.

John A. Giles, formerly commissioner of public works and city engineer of Binghamton, N. Y., and Robert B. Hoadley have organized the firm of Hoadley & Giles, as noted elsewhere in this column.

A. P. Rollins, County Engineer of Polk County, Texas, Prof. J. C. Nagle and J. F. Witt have established the firm of Nagle, Witt & Rollins, as is noted elsewhere in this column.

J. F. Witt, for fourteen years county engineer of Dallas County, Texas, has joined with Prof. J. C. Nagle and A. P. Rollins in the organization of the firm of Nagle, Witt & Rollins, as noted elsewhere in this column.

Prof. J. C. Nagle, Dean of the Engineering Department of the Agricultural and Mechanical College of Texas, has joined with J. F. Witt and A. P. Rollins in the establishment of the engineering firm of Nagle, Witt & Rollins. The firm's offices are in the American Exchange National Bank Building, Dallas.

Arthur H. Blanchard has been appointed professor of highway engineering at the University of Michigan. He will occupy the chair recently established there. Prof. Blanchard will retain his consulting offices at Broadway and 117th St., New York, N. Y., until Sept. 15, after which he will move to Ann Arbor.

Robert B. Hoadley, formerly a county assistant engineer in the New York State Highway Department, has formed a partnership with John A. Giles for the practice of engineering, specializing in municipal and highway work and subdivision and topographical surveying. The firm will be known as Hoadley & Giles and will have offices in the Phelps Building, Binghamton, N. Y.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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ATLANTIC ASPHALT

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVI.
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NEW YORK, AUGUST 27, 1919

Number 9

Highway Maintenance in Wisconsin—III*

Earth Road Maintenance Continued—Use of Road Planers and Graders—Methods for Sandy and Clayey Roads—Care of the Roadside—Cuts and Fills—Guard Rail—Oiled Earth Roads

Road Planer.—We believe each patrolman should be equipped with a road planer in addition to the road grader.

One of the illustrations herewith represents the standard Wisconsin road planer. This type is a combination of the good features of several planers and is giving excellent results.

The weight of the planer and driver is carried upon runners having an over-all bearing of 13 ft. It is designed to "really plane a road," fill all ruts and depressions, but leave the surface of the road with the same crown it originally had. The cutting blades are set at opposite angles of about 50 deg. to the runners and are so designed and placed that the high spots are cut off and moved back and forth between the runners a sufficient number of times to insure filling all ruts and depressions. Any surplus material is leveled up by the rear blade or leveler. Stone can pass out through the opening in the runner just ahead of the rear leveler. The Wisconsin planer neither adds to nor removes the crown. This is work that can be done more easily and cheaply with the road grader. It does, however, fill the ruts and depressions better than any other planer or drag we have tried.

The second illustration herewith represents the standard Minnesota road planer. The weight of the planer and driver is carried upon runners having an over-all bearing of 12 ft. This makes it possible to cut off the high places and carry the surplus material to the low places. The blades are set at an angle of about 50 deg. to the runners and move all surplus dirt in one direction, often leaving a ridge of dirt just outside the runner on the discharge side.

Certain soils dry more quickly than others and it is difficult to say just how soon after a rain the road grader or planer should be used. It is sometimes necessary to wait two or three days after a long rainy spell before the surface is in condition to work. Experience will soon teach each patrolman the proper time to grade or plane each mile of his section.

It frequently is more economical to use a light tractor or truck for hauling the road grader or planer, but if motor power is used, care must be exercised not to operate the machine too fast. As stated before, the speed of a reasonable walk, about 2½ mi. per hour, is preferable for either the road grader, the planer or the drag.

Adding New Material.—All soft spots in the road surface must be dug out and new material, corresponding to the balance of the road surface, used to fill the holes. All low places must be kept filled, using the same material used in constructing the road.

Sandy Loam.—In certain sections of the state where there is a very light subsoil having a loamy top soil of 3 or 4 in. in depth, care must be taken not to grade too deep and to move toward the center of the road only the new top soil from the roadside.

If possible, before turning this type of road over to the patrolman, it should be graded wide and shallow, using a heavy grader pulled by a large tractor, having wheels with wide rims and equipped with deep wheel lugs. The rolling of the material along the grader blade, together with the cutting effect of deep lugs, mixes the new top soil in a manner that generally produces an excellent wearing surface. It is advisable to cover the top soil frequently with about 1 in. of sand from the ditches. The sand takes the wear and adds life to the surface.

The patrolman must give close attention to this type, adding new top soil where needed and keeping all holes and low places well filled.

Clay on Sand.—On sandy sections where there is no top soil that can be brought towards the center of the road to form a wearing surface, clay or loam or muck is used, if available, to assist in binding the sand in order to provide a reasonable wearing surface. The old worn-out sand is thrown out from the wheel tracks with a road grader or some other means, and the surface made practically flat for a width of about 15 ft. The clay is applied to a depth of not to exceed 2 in. at one application. It is spread evenly over the surface of the sand and raked or harrowed thoroughly until all lumps have been pulverized. Then it is mixed thoroughly with the top 6 in. of sand by the use of a disk harrow, farm cultivator or other method. It must be gone over enough times to thoroughly mix the clay with the sand. The object is to use just enough clay to fill the voids in the sand and no more, and to mix the materials so thoroughly that neither pockets of loose sand nor spots of clay remain on the surface. The result is a wearing surface composed of particles of sand bonded together with the minimum amount of clay. Too much clay will cause the surface to become rutted in wet weather and too much sand will cause it to become loose and mealy in dry weather, either of which is detrimental.

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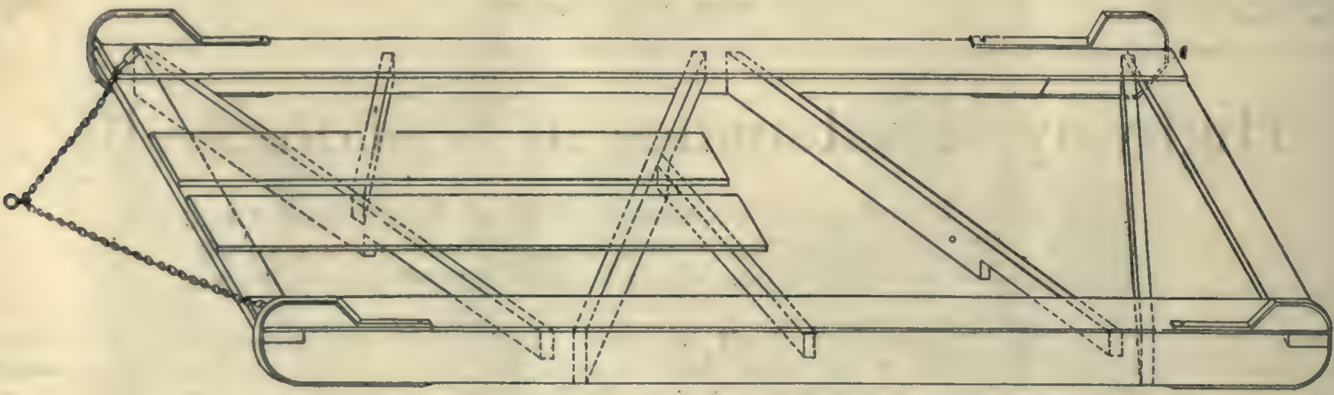
*From "Highway Maintenance," Bulletin No. 8, Wisconsin Highway Commission, a publication devoted especially to patrol maintenance on the state highway system, compiled by J. T. Donaghey, Maintenance Engineer.

There is considerable difference in the quality of clay found in different sections of the state. A simple test of quality may be made in the following manner: Take a handful of the clay, wet it just enough to make it plastic, and work it into a well compacted ball. Place the ball on a board or top of a fence post and allow it to thoroughly dry. After the ball has become hard and dry, immerse it in water. If it dissolves quickly, it does not contain the proper bonding qualities. Should it retain its shape in the water, but gradually wash away, the clay is suitable.

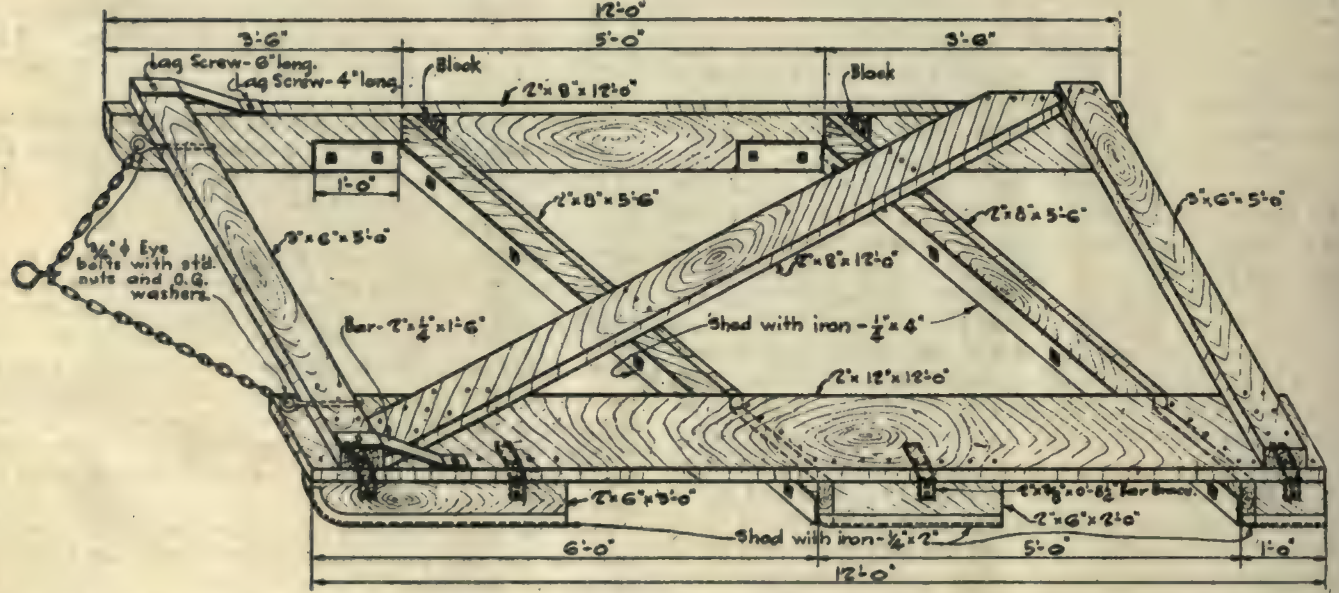
The more sticky the clay, the less is needed to secure the proper bond, but the greater the amount of pulverizing and mixing is necessary.

After being thoroughly mixed, it is shaped up with a road grader and gone over frequently with the road grader or planer in order to keep ruts from forming and to assist in the mixing of sand and clay.

During dry weather, if certain spots appear soft and mealy, clay is needed. During rainy weather, if ruts or mudholes appear, more sand is added.



SKETCH OF WISCONSIN ROAD PLANER.



SKETCH OF MINNESOTA ROAD PLANER.

We do not claim that this type of maintenance will bring about the desired results in one day. It takes time and attention; but the patrolmen soon learn the details of this type and get excellent results with it.

Sand on Clay.—In certain sections of the state, especially along the lake shore, where an exceptionally sticky red clay is found, and in other sections where the soil is a sticky black muck, if good coarse, sharp sand is available, it is added to the clay surface, producing excellent results.

The center 15 ft. of the road surface is plowed or scarified to a depth of 2 or 3 in. and pulverized with a disk harrow, or in some other manner before applying the sand. Sand is applied to a depth of 4 or 5 in. and thoroughly mixed with the pulverized clay by the use of a disk harrow, farm cultivator or other method. The surface is shaped up with a road grader frequently and the road planer used regularly.

If certain spots show a lack of sand, more is added; and if certain spots are loose and mealy, a small amount of clay is added to assist in bonding the surface.

By continuous use of the road grader or planer, and the application of sand or clay where found necessary, an excellent and cheap surface is secured.

Light Surfacing.—We find that excellent results are obtained by covering well graded clay roads with from 2 to 3 in. of fine gravel, mine tailings or sharp coarse sand. The constant moving back and forth of this material by the patrolman's grader or planer soon mixes the gravel or sand

(Continued on page 108)

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIII **August 27, 1919** No. 9

INCREASED FEDERAL AID WANTED

There seems to be a strong sentiment for additional federal aid and for greater direct action by the Federal Government in the building of roads.

As is noted elsewhere in this issue, representatives of seven states in the Middle West and South met recently at Kansas City and prepared a memorial, that has now been presented to Congress, urging "the extension and continuation" of federal aid to the states and setting forth their belief that further federal appropriations "will ultimately give to the entire country a complete system of national highways without further legislation."

Many of the men prominently identified with road work, as county or state officials or as individuals interested in various ways in the betterment of the country's roads, are constantly urging the enactment of laws and the making of appropriations to increase the Federal Government's participation in highway improvement. It is natural to assume that those who hold official positions speak for the public they serve, and it is also reasonable to consider the views of many not in official positions as pretty accurately reflecting the sentiment of the general public. And, so far as the great masses of the American people have given expression to their views, they have quite generally gone on record as in favor of more and better roads. Those cases of opposition to enlarged programs are exceptions and are usually due to local causes entirely outside the merits of the case.

Assuming, as we seem to be warranted in doing, that the people are in favor of good roads and especially of federal or federal aid roads, how can their wishes best be met? Is the answer greatly increased federal aid under the existing plan, or the building of national roads by the Government with federal funds? And if the latter, how and by what sort of organization should it be carried on?

The memorial referred to earlier urges the use of increased appropriations and the continuation of federal aid "as now obtains in the appropriations already made." An increasingly large number of good roads advocates want, not federal aid, as we now have it, but federal construction of a national highway system. Some of the latter want the work put under a federal department of public works that will control not only road work but also other like activities of the Government. An apparently larger number want a Government department or commission devoting its efforts exclusively to road work.

Bills reflecting all these divergent views as to the methods to be adopted to improve the country's road system are now pending in the Congress. How soon they will be acted upon is very uncertain, but it is quite sure that something will be done eventually. Whether the solution found shall be the right one depends very largely upon the road builders of the country. The subject is one that is very near to them and to which they can, if they will, bring the best thought of the nation. They have an opportunity for service that they should not neglect to improve.

TEXAS BUILDS ROADS

Though it was a number of years after the state aid principle had found very general adoption among the commonwealths of this country before the State of Texas enacted the necessary laws and established a state highway department, she has not lagged in the betterment of her roads. For a good many years the people of her counties have been voting large bond issues, providing themselves with the necessary administrative machinery and engineering forces and going ahead with the building of new roads and the improvement of existing ones.

The state now has a state highway department and is going to vote on a $75,000,000 state bond issue in November. The state's share of federal aid amounts to some $16,000,000—which is about 6% of the Government's total contribution to road work—and the counties are continuing to vote large bond issues. Taking all sources into account, according to a statement by the former chairman of the State Highway Commission, which is printed elsewhere in this issue, there is actually available a total fund of approximately $80,000,000.

This sum, it should be noted, does not include the proposed state bond issue nor the county bonds, amounting to about $25,000,000, that it is said are likely to be voted before the end of the year. Adding these, and also the funds that will come to the state if Congress approves additional federal aid called for by bills now pending, the state will have available "in the near future," according to Mr. Hancock, some $200,000,000.

These figures are interesting and instructive, especially if considered in connection with other Texas statistics. The state has an area of 265,896 sq. mi. or nearly 9% of the entire area of the United States, exclusive of Alaska, the Canal Zone and its island possessions; about 129,000 mi. of roads or about 5% of the entire mileage of the country, and a population of 4,601,279, or less than 4½% of the entire population of the country. In 1904, according to the Bureau of Public Roads, 1.75% of the road mileage of Texas was "surfaced." This increased to 3.80% in 1909, and to 8.16% in 1914. According to the same authority, the total revenues applied to roads and bridges increased from $4,138,157.49 in 1904 to $9,920,079.11 in 1914, or 139.7%. During the same period the state's road and bridge revenues increased from $34.08 to $76.92 per mile of road, from $15.77 to $37.80 per square mile of area, and from $1.35 to $2.54 per capita.

Texans are naturally proud of the record their state has made. And they may be pardoned when it is considered that if the estimates noted here are correct—and if proportionate expenditures were made—the probable expenditure for the whole country "in the near future" would be nearly $2,250,000,000 on a basis of population, about $4,000,000,000 on a basis of road mileage and close to $4,500,000,000 on a basis of population—or about $3,250,000,000, estimated about as is the distribution of federal aid, one-third in proportion to population, one-third in proportion to area and one-third in proportion to road mileage.

Highway Maintenance in Wisconsin—III

(Continued from page 106)

with the clay surface, forming a crust that is more or less waterproof and is not slippery in wet weather. The patrolman must have stock piles of like material along the roadside and add new material where ruts or soft spots appear. A good cheap surface can be built up in two or three seasons in this manner provided patrol maintenance is employed.

Sand.—In the majority of sand road sections, the surface can be maintained in fairly good condition by the use of the light grader and planer. Occasionally there are two or three hundred feet at the foot of a grade where sand has washed down following the wheel tracks and lodged at the foot of the grade. The grader or planer will do little or no good on these spots.

In these cases the surplus sand is removed from the center of the road by use of a slip scraper, and where gravel, clay or loam is not available, cinders, cedar bark or shavings may be used with very good results. In extreme cases, marsh hay or rye straw is used, but the service hardly equals the expense. It is more economical to haul gravel or clay a long distance.

Care of Roadside; Brush and Weeds.—The patrolman must remove or trim up all trees which interfere with construction, maintenance or vision, as soon as time will permit. Many dangerous corners and turns are made safe by cutting away a few brush or trimming up a tree to a point where the driver of a car may easily see a vehicle approaching from the other direction. When necessary to remove brush or trim up trees on private property, request in advance the owner's permission, which we are sure will not be refused if the object is explained.

The brush, weeds and grass must be kept cut along the entire roadside and especially near the mile-posts and culvert end walls, so that the traveling public will have no difficulty in seeing them as they approach in either direction. Arrangements generally can be made to rent a mower for this purpose once or twice during the season.

All brush and weeds cut must be burned or removed from the roadway immediately.

The good patrolman will look ahead and so arrange his work as to do this at times when he cannot work to advantage in maintaining the traveled way.

Cuts and Fills.—Where heavy cuts and fills have been made on a section, the side banks of the cuts and the slopes of the fills have a tendency to wash. The patrolman must cut sub-ditches back from the edge of the slope on banks to carry the water down and away from the slopes, thereby avoiding washing.

The patrolman should sow grass seed on the slopes for the purpose of eliminating washing and to add to the scenic beauty of the roadside. The slopes of fills should also be seeded, and in this connection it is sometimes good policy to sow rye with the grass seed, which protects the tender blades until they have grown root. The rye should be kept cut down and not allowed to go to seed.

At certain places it is easier and cheaper to sod the embankment than to wait for the seeding to form a sod. Work of this nature should always be done during moist weather so that the seeding can take root, and where sodding is done, the chances are much more in favor of its living.

Guard Fence.—Standard guard fences should be placed at all dangerous places where none now exist. Where guard fences have been placed, they must be taken care of, painted occasionally and kept in the best of repair by patrolman.

Ditches.—Where the ditches and toes of fills are inclined to wash, they must be riprapped with cobble stone. Where no stone is available for this purpose, use concrete if possible. If not, willows, brush, shavings, or bark may be used to good advantage.

Oiled Earth Roads.—We have had but little experience in oiling earth roads in Wisconsin and the experience in other northern states is very limited. The high price of oil at the present time does not warrant going into this work in an extensive way. It is not good practice to apply oil to an earth road until a crust has been formed on the road surface by continued grading or planing, and then only when the road has been brought to the proper crown and first-class drainage exists.

In any section where the county officials or local people wish to finance the oiling of a certain earth road properly, the division engineer, upon request, will investigate the proposed improvement and if he deems it practicable, will arrange for supervision on the work.

(To be continued)

Huge Road Expenditures in Texas

Fund of About $200,000,000 in Sight for Road Work, According to Recent Statement by Former Chairman of Highway Commission

A fund amounting to approximately $200,000,000 is in sight for road work in Texas in the near future, according to a recent statement attributed to Curtis Hancock, the former chairman of the State Highway Commission.

According to the statement, about $9,000,000 from bond issues previously voted was on hand on Jan. 1, and is now being used for work under way. From Jan. 1 to July 1, county and district bonds amounting to a total of about $53,000,000 were voted. The state highway fund contains over $1,000,000 and the federal aid to be received by the state amounts to about $16,000,000. This makes a total of about $80,000,000 that is actually available. It is reasonable to expect, according to Mr. Hancock, that at least $25,000,000 more in road bonds will be voted before the end of the year. Continuing, he said, in part:

"There is now pending before the voters, to be passed upon on Nov. 4, a state-wide bond issue of $75,000,000. There are also pending in Congress several bills seeking to appropriate for additional federal aid $500,000,000. If Congress should make this appropriation on the basis of distribution to the states of former federal aid, Texas will receive $30,000,000 as her share.

"With the aid actually in sight and the financing that has already been done, added to that of reasonable prospects for future state and federal aid and county financing, $200,000,000 will be available in Texas in the near future for road construction. Road builders and men who follow closely the road construction movement are surprised at the amount of work now in progress and in contemplation. If Texas carries to completion this enormous program, this state will become as well known for its highways as has California."

Highway Progress in Oregon

Projects Under Construction or Contract Include Over 350 Miles of Paving, Nearly 150 Miles of Macadam and About 500 Miles of Grading—Total Cost Over $15,000,000

According to a report recently issued by the Oregon State Highway Department, there is now under construction or contract 352 mi. of paving, 146 mi. of macadam construction and 480 mi. of grading. The total cost, as represented by the bids submitted, will be nearly $15,500,000, including allowances of 10% for the engineering and 10% for contingencies. The projects under contract and the bid prices are as follows:

Columbia River Highway, $3,323,628.21; Pacific Highway, $3,887,473.80; West Side Pacific Highway, $1,335,937.40; Salem-Dallas Highway, $320,742.50; Yamhill-Nestucca Highway, $426,682.11; Coast Highway, $601,054.00; Portland-Forest Grove-McMinn, $746,879.90; Ashland-Klamath Falls, $177,415.50; Crater Lake Highway, $246,000.00; John Day Highway, $336,404.80; La Grande-Enterprise Highway, $42,370.00; McKenzie River Highway, $97,500.00; Old Oregon Trail, $308,666.60; Oregon-Washington Highway, $275,136.00; Baker-Cornucopia Highway, $176,431.75; Flora-Enterprise Highway, $73,500.00; Mount Hood Loop Highway, $227,567.60; Grants Pass-Crescent City, $62,985.35; Burns-Lawen, $197,967.00.

Western and Southern Highway Officials Urge Increased Federal Aid

Appropriations of $400,000,000 for Use Under Terms of Present Law Asked in a Memorial Recently Presented to Congress

Representatives of seven state highway departments in the Middle West and South have expressed their opinion in regard to Federal Aid and to pending Federal road legislation in the following memorial which has recently been presented to Congress:

Representatives of the state highway departments of the following states:

Kansas
Nebraska
Iowa
Missouri
Oklahoma
Arkansas
Texas

met in conference in Kansas City, Missouri, on July 30, 1919, to discuss highway problems. It developed that the federal aid allotted to the states for highway construction is insufficient to meet the call of the people.

We, therefore, urgently request the extension and continuation of federal aid to the states in the construction of highways as now obtains in the appropriations already made, and believe that further appropriations as the policy of the Government will ultimately give to the entire country a complete system of national highways without further legislation.

Each state has laid out a complete system of roads connecting all main market centers and joining a like system with the adjacent states.

The immediate call for additional appropriations is due to the fact that many states have already obligated themselves to the several counties for the entire amount of federal aid allotted to them by the appropriations passed in February, 1919, and have on hand, in some cases, petitions and bond issues for additional roads equal to the amounts already set aside.

Before July 1, 1920, all of the present federal appropriation will have been obligated by the several highway departments and without additional appropriations definitely made, the incentive for the people to continue road building is gone.

In most states, bond issues by the several counties have been carried entirely upon the promise of federal aid, and in the states where highway departments have already been compelled to give public announcement that all the federal aid is exhausted, further bond issues cannot be voted and continued road petitions will be stopped unless future assistance by Congress is assured.

The appropriations already made by Congress to spur on road building and give employment to many classes of labor have been most enthusiastically met by the people and often to such an extent that many petitions are now on file with state highway departments which cannot be given consideration.

One of the great incentives in state road building with federal aid has been the assurance of federal supervision in construction, and if additional aid is not given, many projects cannot have this supervision which is so much desired.

Feeling that Congress is fully alive to the necessity of substantial road building as one of the great requirements of the times to facilitate transportation for the marketing of crops and to intensify all kinds of rural development, we would most respectfully request that an additional appropriation for federal aid in highway construction be made immediately, said appropriation to be as follows:

The sum of $100,000,000 for the fiscal year ending June 30, 1921.

The sum of $100,000,000 for the fiscal year ending June 30, 1922.

The sum of $100,000,000 for the fiscal year ending June 30, 1923.

The sum of $100,000,000 for the fiscal year ending June 30, 1924.

All sums to be apportioned and expended in accordance with the provisions of the Federal Aid Act, approved July 11, 1916, as amended by the Post Office Appropriation Bill, passed in February, 1919, and that each state shall be entitled to its full apportionment until one year after the expiration of the last appropriation allotted to that state; i. e., until June 30, 1925.

Additional Bids in Pennsylvania

State Highway Department Announces Big Letting Sept. 2—4.72 Miles Involved

The Pennsylvania State Highway Department has announced that bids will be received on Sept. 2 for the construction of 47.2 mi. of new highways in various counties.

The work in Adams County is on the Lincoln Highway in Gettysburg Borough, on the road between Carlisle and Gettysburg in Butler Township and on the road between Gettysburg and Harrisburg in Tyrone and Strabane Townships. In Butler County, it is planned to put down over 3 mi. of reinforced concrete near Slippery Rock on the road connecting Butler with Mercer. In Northampton and Carbon Counties, about 3 mi. of concrete pavement will be built on the route connecting Mauch Chunk with Allentown and Bethlehem.

The work in Centre County is in Rush Township, near Osceola. There are two jobs in Chester County, the work consisting of the construction of 32,000 lin. ft. of bituminous pavement. In Clarion County 10,507 ft. of concrete will be put down on Route No. 64, between Clarion and Brookville. About 2 mi. of concrete pavement will be laid in Bell Township, Clearfield County, on the road between Clearfield and Ebensburg. In Crawford County 3.5 mi. of concrete and hillside vitrified brick will be put down on Route No. 89 which connects Meadville with Titusville, and about the same mileage will be built with the same materials in Vernon Township, west of Meadville.

In Erie County, there are five construction jobs, all on important roads connecting Erie with southern points in the state. In Indiana County, nearly 4,000 ft. of concrete are to be put down on the William Penn Highway for which bids were received some weeks ago and were rejected. About 6 mi. of concrete are planned for the road in McKean County connecting Bradford with Mt. Jewett, Kane and Ridgway. Readvertised work in Mifflin County consists of 24,049 ft. on the William Penn Highway in Armagh Township.

There are two jobs in Potter County and about 6 mi. in Snyder County. There are also jobs on important roads in Susquehanna, Tioga, Wyoming and York Counties.

Massachusetts Highway Association

OFFICERS FOR 1919

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JOHN M. McCARTHY, Secretary	15 Ashburton Place, Boston
CHARLES A. BROWN, Treasurer	Wellesley

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RICHARD A. JONES	Waltham

Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston.

News and Gossip

After a delay of nearly two years it is now expected that the new bridge which spans the Charles River at the Watertown Arsenal will be opened to the public within a month.

This will provide a short cut for residents of Waltham, Watertown and points west to reach Union Square, Allston, which gives direct road connections to Commonwealth avenue and Beacon street.

The new bridge was authorized in 1914 and was built by the Metropolitan Park Commission under the direction of its engineer, Mr. John R. Rablin. It is of reinforced concrete over steel frames and is in three spans.

The total cost has been $174,853, apportioned on a basis of 35% each to Boston and Watertown, 5% to the county of Middlesex, 10% to the Commonwealth and 15% to the Newtonville & Watertown Street Railway, a branch of the Middlesex & Boston system, which is granted a double-track location over the bridge. The Metropolitan Park Commission has turned the bridge over as completed.

Up to Aug. 1 there were registered in Massachusetts 159,211 passenger automobiles, which exceeds 1918 figures by 16,597 cars. The truck registrations to August 1 were 36,820, which is an increase of 6,729 over last year.

The state has received all together for motor licenses, $2,328,587.28. This amount exceeds last year's total income from this source by $144,176 and there still remain five months for registration.

One of the most important highway improvements made in the eastern section of Massachusetts is nearing completion. The "death curve" in Weston has been eliminated and one of the most dangerous turns in the state has been straightened out.

This corner, which is on the Boston-Springfield route, is located a short distance beyond the new concrete bridge, over the Charles River at the Newton line. There have been several fatal accidents, and during a considerable period this spring there was at least one serious accident each week.

The great improvement came about through the generosity of the Misses Case, whose home is directly opposite the dangerous curve, and as it is the nearest house it has many times been used as a temporary hospital for persons injured in accidents. These two public-spirited ladies offered land for relocating the roadway and proposed to contribute $9,000 in money toward the expense of the improvement. The gift was quickly accepted by the Town of Weston and the work has been successfully carried out by Superintendent of Streets Raymond Coburn, and will cost when completed approximately $15,000.

Mayor Peters, of Boston, recently conceded all of the demands made by the engineers employed by the city. The new rates are as follows:

Operating engineers at pumping stations, $37 per week; marine engineers on the city ferries, $42 per week; in public buildings, engineers in charge, first-class plants, $42 weekly; operating, $37 per week; in charge of second-class plants, $37 per week; operating, $33 per week, in charge of third-class plants, $33 per week, operating $30 per week. Firemen and oilers in all plants receive an increase of 50 ct. per day, to $5 per day.

Plans are progressing rapidly for the Massachusetts Pilgrim tercentenary. The state commission in charge of this work has raised $250,000 and Congress has been asked to appropriate an additional $500,000.

In view of the fact that the actual landing was December 21, 1620, there will be appropriate ceremonies on December 21 next year and the real celebration will take place during the following summer when pageants and various other forms of entertainment will be continued during several months.

Town Manager Bingham of Waltham had the distinction of being the first town official in Massachusetts to give citizens the privilege of purchasing army food supplies. The sale was a great success and Mr. Bingham was commended on all sides for his prompt action.

Hugh G. Kennedy, the popular street commissioner of Medford, has been confined to the hospital for nearly a month after undergoing a serious operation. His progress has been favorable and his friends will be pleased to know that he expects to be able to resume his duties in a short time.

During Mr. Kennedy's absence, the work of his department has been carried on by Mr. John J. Golden, who was until recently superintendent of street cleaning at Manchester, N. H.

Carl G. Richmond, formerly Superintendent of Public Works of Revere, has received his discharge from the army and is now engaged in the contracting business.

Selectman Osborne of Marblehead is moving to have the various public town ways to the shore at Marblehead Neck located and marked according to the old records. These ways have from time to time been set off, but many of them have become disused and few persons know just where they are.

Establishment of a state-wide system of motor transportation and the creating of a similar system throughout New England by cooperation with the governors of the other states, to be utilized in case the railroad systems are tied up by another strike, will be recommended to Governor

(Continued on page 112)

New York State Road Builders' Association

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JOHN H. GORDON, President	Albany
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W. T. THAYER	Chateaugay
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JOSEPH WALKER	Albany
S. B. VAN WAGENEN	Rondout

Legislative Committee

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JOHN B. DOWER	Ballston Spa
H. B. HARRISON	Buffalo
JOS. McCORMICK	East Providence, R. I.
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N. E. YOUNG	Union
S. B. VAN WAGENEN	Rondout

Membership Committee

RICHARD HOPKINS, Chairman	Troy
FRED E. ELLIS	Melrose, Mass.
W. A. GREENFIELD	Hornell
C. J. HENDRICKSON	Syracuse
J. F. PADDELFORD	Sherburne

Crusher Run

State Highway Commissioner Greene declares that concrete roads will do away with excessive maintenance charges and will stand the constantly increasing motor traffic. He has issued the following schedule of roads which were completed in 1912, and maintained up to 1919 at an enormous cost, and says that many of them will probably have to be built:

County.	Construction Cost.	Maintenance Cost.
Genesee	$54,395.45	$75,081.76
Montgomery	31,125.53	58,680.07
Jefferson	65,200.70	36,892.55
Livingston	45,105.16	32,357.10
Onondaga	99,867.77	49,402.04
Ontario	76,282.93	51,961.49
Otsego	54,457.48	23,440.42
Rensselaer	8,660.09	4,437.09
Rensselaer	39,211.46	21,910.29
Suffolk	53,551.56	29,142.66
Suffolk	100,924.06	74,888.14
Tompkins	34,339.72	22,158.29
Wyoming	16,000.95	8,623.73
Dutchess	51,792.70	41,772.67
Fulton	9,779.84	5,603.59
Herkimer	69,283.36	39,611.56
Nassau	29,511.25	23,876.91
Oneida	13,861.57	9,764.43
Steuben	16,952.59	9,219.31
Steuben	52,156.06	30,471.08
Steuben	10,891.44	9,887.68
Wayne	26,515.09	37,062.18

Senator Chas. J. Hewitt, of Cayuga County; John Knight, of Wyoming County, and Jas. J. Walker, of New York, have been appointed senate members of the legislative committee to apportion highway routes, which are to be built with federal aid.

Capt. C. Gordon Reel, former State Highway Commissioner, is using the knowledge of the geography of New York State which he gained during his tenure of office as highway commissioner, to formulate plans for a chain of municipal aviation fields throughout New York State. Governor Smith met Capt. Reel and Col. Miller, who were accompanied by a squadron of five planes.

The French Government has just made known that two platoons of the 302d Engineers of the 27th Division, commanded by Capt. Frederick Stuart Greene, Commissioner of Highways, spanned the Vesle River in record time and won the Croix de Guerre. The feat was performed under heavy shell fire, and enabled the French and American troops to drive the Germans from a strong position north of the Vesle River.

William H. Slingerland, aged 55 years, employed in the drafting room of the State Highway Commission, and a well known civil engineer, met a tragic death on the Troy Road directly opposite the Federal Signal Works. Mr. Slingerland was engaged in surveying part of the road in the neighborhood, and in attempting to avoid an approaching trolley car he stepped directly in front of an automobile which was proceeding at a rapid pace. He was thrown several feet into the air and landed in a ditch at the side of the road.

Employees of the State Highway Commission who served in the world war were guests at an outing given by Commissioner Greene and his deputies Paul Schultze, Irving A. Huie and Charles Van Ambergh. Athletic contests and a baseball game were some of the features of the outing.

The following awards were made at the letting which took place at the New York State Highway Department on July 22, 1919.

Paddelford & King, Road No. 1,497, Chenango County, $120,594.10; John D. Rust, Road No. 1,353A, Onondaga County, $19,416.75; Brayer Bros., Road No. 1,317, Cayuga County, $6,303.00; Rosoff Engineering Co., Road No. 1,381, Chautauqua County, $87,111.15; Paddelford & King, Road No. 1,394, Chenango County, $104,189.05; Harradine Bros., Inc., Road No. 1,345, Saratoga County, $33,231.00; E. W. Foley Contracting Corp., Road No. 1,400, Seneca County, $123,337.70; John P. McDermott, Road No. 1,048A, Suffolk County, $85,124.00.

Repair Contract Awards: Jesse J. Crouch, Road No. 1,231, Alleghany, Schuyler and Steuben Counties, $30,451.74; Frank D. Griffin, Road No. 1,024, Chenango Co., $30,352.05; McGreevey, McGuigan & Baum, Road No. 1,037, Cortland County, $18,964.18; Lane Construction Co., Road No. 1,215, Oswego County, $40,303.90.

At the same letting, Jos. F. Stobell, Buffalo, N. Y., a new bidder on state road work was awarded the first contracts for building roads to be improved with federal aid. The three contracts are as follows: Road No. 8,007, Cattaraugus County, $161,646.50; Road No. 8,001, Chenango County, $202,146.00; Road No. 8,002, Chenango County, $213,905.00.

Considerable red tape had to be unwound by Commissioner Greene before the Bradford, Pa., Highway, Road No. 8,007, was let. Quick consent had to be obtained from Secretary of Agriculture Houston in order to get the right of way over the Alleghany Indian Reservation. Plans for the highway were changed so as to save the state $70,000. Other changes eliminated three grade crossings and shortened the road 3 mi. Secretary Houston approved the changes and sent a Government engineer to survey the road.

Commissioner Greene has started a campaign against advertising signs along state highways and has instructed the division engineers to enforce the law prohibiting their erection. Owing to war conditions, the law was suspended for about two years in regard to compelling the cutting of weeds and brush along the highways. According to the law the weeds and brush must be cut during the month of August by property owners along the highway

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Road No. 8,001, Green-Oxford Part 1, will complete the section of improved state highway between Utica and Binghamton. Former Commissioner Duffey's plans called for 14-ft. water-bound macadam construction. Owing to the heavy motor trucks, Commissioner Greene changed the design to an 18-ft. concrete road.

The following awards were made at the letting which took place at the New York State Highway Department on July 29:

E. J. Bailey, Road No. 8,008, Chautauqua County, $131,554.50; Henry P. Burgard Co., Road No. 1,397, Jefferson County, $127,709.81.

For completion contracts the following awards were made:

Wm. J. Fox, Road No. 5,615, Allegany County, $180,623.50; Fure & Fote, Road No. 5,543, Cattaraugus County, $147,109.50; Scott Bros., Road No. 5,610, Cayuga County, $153,343.80; S. B. Van Wagenen, Road No. 5,580, Dutchess County, $108,279.65; Samuel Beskin, Road No. 5,628, Dutchess County, $150,007.60; F. H. Rhody, Road No. 1,255, Jefferson County, $179,686.25; Henry P. Burgard, Road No. 1,256, Jefferson County, $121,575.84; Atlantic Construction Co., Road No. 5,593A, Livingston County, $186,022.01; Greenfield Construction Co., Road No. 1,390, Monroe County, $35,316.83; H. G. Schroeder, Road No. 1,391, Monroe County, $166,356.00; R. T. Ford Co., Road No. 1,393A, Monroe County, $191,956.50; Ribstein-Holter Co., Road No. 1,466, Monroe County, $71,785.55; John Petrossi Co., Road No. 1,499A, Monroe County, $128,060.71; P. H. Murray, Road No. 5,597, Oneida County, $169,095.00; L. D. Sullivan Co., Inc., Road No. 1,072, Onondaga County, $59,526.25; John L. Hayes Construction Co., Road No. 5,498, Orange County, $453,583.85; Willis L. Frost, Road No. 5,557, Schuyler County, $89,244.50.

The Storm King Road in the above letting, Road No. 5,498, Orange County, which was awarded to the John L. Hayes Construction Co., presents a very large engineering task. A 4-mi. notch is being chopped out of Storm King Mountain on the west bank of the Hudson River, between Newburgh and West Point, to build the finest and most picturesque bit of highway in the United States. Before it is thrown open to the public next year by Commissioner Greene, the road will cost the state $1,000,000. Engineers say that it is one of the most difficult highway engineering problems yet to be tackled. The John L. Hayes Construction Co., of Yonkers, N. Y., have an enormous and expensive plant on the mountain. In order to safeguard the public traveling on the West Shore Railroad, Commissioner Greene has instructed Contractor Hayes to operate a traveling crane on the railroad tracks and spur at the foot of the mountain to facilitate the removal of bowlders from the track. The retaining wall will be built of cement.

The following awards were made at the letting which took place on Aug. 5, 1919:

M. J. Bruce Co., Road No. 1,252, Franklin County, $121,239.26; Thos. F. Murray, Road No. 1,402A, Genesee County, $51,355.05; Wing & Munger, Road No. 1,403, Genesee County, $103,963.58; John A. Jova, Inc., Road No. 1,425A, Rensselaer County, $31,506.20; Ansel A. Howard, Road No. 1,349A, Wyoming County, $48,816.00.

The month of August registers another letting which took place on the 26th. In this letting there were 17 roads advertised, 5 improvement contracts, 11 completion contracts, and 1 repair.

Out of the 12 road contracts that were advertised on August 5, there were proposals received for only 7. Commissioner Greene says that the great scarcity of labor is the cause of not having more contractors bid on the jobs. There are comparatively few contractors in the state who have a large force of men at their command, and those who have are forced to pay the highest wages. Since the war ended, thousands of foreigners, especially Italians, have sailed for home, and contractors report that it is a difficult matter to get enough men to start a job.

Previous to the accident which took place at Guilderland Centre, at the railroad crossing, state highway officials had just completed a photograph of the crossing. As a result of this accident, Commissioner Greene will order photographs of all crossings immediately following accidents so that wide publicity will be given them.

Horatio S. Mattimore, for many years director of tests in the State Highway Department, has resigned to accept the position of engineer in charge of tests and material in the Pennsylvania Highway Department. Mr. Mattimore attained a national reputation in the selection of concrete and highway material during his connection with the New York State Highway Department.

Failure of bids on five highway contracts at the Aug. 5 letting, apparently because the engineer's estimates were too low, has caused Commissioner Greene to direct new estimates to be made. The boards of supervisors in Broome, Rensselaer and St. Lawrence and other counties will be asked to make provision for the extra cost of building the roads.

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News and Gossip

(Continued from page 110)

Coolidge on Monday, by the committee appointed by the mayor to advise ways and means to bring food into Boston during a railroad strike.

The committee, of which Maj. Thomas F. Sullivan, Commissioner of Public Works, is chairman, was appointed by Mayor Peters a short time ago in order to anticipate any serious situation which might be created by reason of a widespread strike and the complete tying up of freight shipments. The committee has held several meetings and has come to the conclusion that only a system of motor truck trunk lines which covers the entire New England district would be able to cope with the situation. It is for that reason that it will make its recommendations to the governor in the hope that he will, in turn, call together the governors of the other New England States to work out the plans the committee has in mind.

The committee has made a complete investigation of the situation and finds that the city is in a position to withstand a prolonged railroad strike without experiencing any material hardship. A complete organization is available in the city to cooperate with various local industries and it is thought necessary to develop this organization along regional lines somewhat after the plan of the Public Safety Committee.

President Gannon of the Massachusetts Highway Association is at present on crutches and nursing an injured foot. He was directing the removal of a tree on one of the main streets of Fitchburg, when one of the limbs fell to the ground and struck him on the instep. It was a very narrow escape from serious injury, and members of the Association will be glad to know that he was fortunate to get off with such slight damage.

The Town of Stoneham is reconstructing a section of Main street in the Farm Hill section, and when completed this will complete the surfacing of the main highway north and south through the town.

Agitation for a tunnel beneath Boston Harbor from the city proper to East Boston has been started again and now that the war is over and Massachusetts is endeavoring to build up the export traffic, the outlook for the project seems bright.

The Cunard Line terminal and the Boston & Albany docks are in East Boston and when freight comes from the West it must either be lightered across the harbor or else the trucks that haul it must either make a slow ferry trip or traverse a roundabout route of 5 mi. through Chelsea. This is also true of outbound freight. A tunnel for motor trucks would solve this problem.

Some years ago an effort was made to have either a tunnel or a bridge constructed. Plans for a bridge were considered and the cost estimated, but the project fell through, partly because the War Department objected, as the Navy Yard would be above the bridge. Now the Legislature has passed a resolution providing a sum of money for experts to make a study of the cost and report to the next Legislature. The proposed tunnel would be about a mile in length.

SOME MASSACHUSETTS TAX RATES FOR 1919.

	1919.	Increase Over 1918.
Danvers	25.60	4.80
Attleboro	21.80	2.20
Springfield	21.20	2.70
Worcester	22.40	1.20
Haverhill	26.00	4.20
Lowell	25.00	1.20
Reading	29.40	4.40
Lexington	26.60	1.60
Newburyport	25.00	No increase
Ipswich	19.00	Reduction of $3.40

New Hampshire Good Roads Association

OFFICERS FOR 1919

FREDERIC E. EVERETT, President	Concord
WINFIELD M. CHAPLIN, First Vice President	Keene
HARRY L. SMITH, Second Vice President	Lakeport
W. B. HOWE, Secretary and Treasurer	Concord

Board of Directors

O. F. WINSLOW	Nashua
C. M. BROOKS	Keene
H. W. SPAULDING	Manchester
ALFRED CLARK	Concord

Be sure and attend the next meeting of the New Hampshire Good Roads Association. It will be held at Berlin, N. H., on Sept. 11.

The City of Manchester proposes to inaugurate a system of health and accident insurance for its employees. Commissioner Kirby has been investigating the matter for some time and data are now being prepared by insurance company agents for the consideration of the city officials.

At present no compensation is paid any employee of the Public Works Department in case of accident or sickness; the insurance plan would take care of him during any time that he might be incapacitated.

Manchester is rated fifth among New England cities as regards working and pay conditions in the Department of Public Works.

The Hill dam case will now go to the Supreme Court for adjudication. Frank R. Woodward, of Hill, was the defendant in the action brought by four different plaintiffs for damage caused when the Hill dam gave way in May, 1918. The total of these claims amounted to about $80,000.

It has finally been decided to improve the approach to the Suncook Bridge at Concord. Mayor French and the town officials of Pembroke recently inspected the bridge and approaches and it was decided to widen the road and bank the curves to make it as safe as possible for motor traffic. This is a very dangerous spot and there have been several fatal accidents.

Col. Frank R. Shunk, Engineer Corps, U. S. War Department, recently called a meeting at the City Hall in Manchester to consider the important problem of the development of the Merrimac River reservoir basin project.

The plan is to construct a storage basin at the head waters of the river so that in times of drought and freshets the flow of water will be under control.

George P. Winn has resumed his position as city engineer of Nashua, having recently resigned from his position with the Government as cost engineer, U. S. Housing Corporation, Bath, Maine.

John P. Cyr has also resumed his duties in the engineer's office after a year's absence overseas, and it is both entertaining and instructive when he and Henry Bergeren, the roller-man, get together and swap stories of their experiences in camp at Brest, in the Argonne Forest and at Verdun.

Street work in Nashua is progressing rapidly on the different jobs. Prospect Street, near the hospital, is practically finished. It is paved with a hot-mix bituminous pavement, with cement concrete gutters. With its splendid maple trees, Prospect Street is one of Nashua's most beautiful thoroughfares.

Factory Street, from the block paving at the Nashua Manufacturing Co. to its end, is to be resurfaced with hot-mix bituminous pavement and concrete gutters are to be built. This is a much needed improvement and one that will be appreciated by all who have had occasion to use the street.

The old Amoskeag Bridge in Manchester has been condemned and plans for a new structure are now being considered.

The many suggestions already made include a concrete arch bridge with a width of 48 ft. 6 in. over all, and a 38-ft. roadway, costing $400,000. It is generally believed that it will not be necessary to spend more than $350,000 or $375,000 on the project.

William Blanchette, of the 603d Engineers, U. S. A., has returned from overseas and has taken his former position in the office of the city engineer of Laconia.

The Laconia Street Department has about completed the section of state road from the city toward the New Hampshire School for Feeble Minded Children, funds for which were appropriated at the last session of the New Hampshire Legislature.

The Department expects to start shortly on the $30,000 federal aid project between Laconia and the Weirs, which is a part of the Merrimac Valley trunk line.

The extremely dry weather and the greatly increased motor traffic during the past month have done much damage on the gravel roads in all sections of the state.

"EX-SERVICE MEN—ATTENTION PLEASE."

All roads lead to Laconia and the Weirs on the 27th and 28th of August, the occasion being the annual encampment of the New Hampshire Veterans and the American Legion and Laconia's welcome home to her soldiers in the Great War.

Governor Bartlett will welcome home all the New Hampshire soldiers, and service men from other states are cordially invited to be present.

The New Hampshire State Highway Department is operating a very efficient method of directing tourists on the various detours in the state.

A large black and orange sign is used as a guidepost during the day, and at night the detours are lighted by green lanterns. At the beginning of each detour a large sign is put up, carrying instructions to follow the arrows by day and the green lights by night.

State road work is going on under the direction of Commissioner Everett in 40 "state aid" towns, 20 trunk line towns and 17 "federal aid" towns, and within a short time a number of additional federal aid jobs will be started.

Labor has been very scarce and the price of hay has been so high that farmers have been willing to pay higher rates for labor than the contractors and others engaged in road work could afford to pay.

The state will have about $1,200,000 to spend this season. That sum is made up of $600,000 federal aid money and a like amount provided by the towns. Applications to share in the federal fund have been made by 197 towns.

Former Superintendent of Streets Ovid F. Winslow and his family started on Aug. 16 on a sight-seeing trip through Canada, including the Maritime Provinces. They will make the trip by automobile.

MEETINGS

Calendar of Coming Meetings

Nov. 12-14—American Society of Municipal Improvements. —Annual convention, New Orleans, La. Secretary, Charles Carroll Brown, 304 East Walnut St., Bloomington, Ill.

Feb. 9-13, 1920—American Road Builders' Association— Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

The annual convention of the Ozark Trails Association will be held at Roswell, N. M., Oct. 1, 2 and 3. The last meeting of the organization was held at Miami, Oklahoma.

The Southern Appalachian Good Roads Association will hold its annual convention at Asheville, N. C., some time in November, the exact date not yet having been decided upon. A. D. Williams, Parkersburg, W. Va., is president of the association.

PERSONAL MENTION

William J. D. Lynch has resigned as assistant engineer of Nutley, N. J.

C. B. McKey is secretary of the Western Engineering Co., which has recently been organized to handle federal aid road work.

W. H. Ramp has resigned as city engineer of Parkersburg, W. Va., to become associated with the North Carolina State Highway Department.

Warren B. Burch has been appointed county engineer of San Luis Obispo County, California. He was formerly city engineer of San Luis Obispo.

D. K. Caldwell, of Jackson, Miss., has been retained as highway engineer on the work to be done by Smith County, Texas, under a $1,500,000 bond issue.

J. A. Campbell, Jr., is president of the newly organized Western Engineering Co., of Topeka, Kan. The company will specialize in federal aid road work.

Lieut. Frank Mitchell, Engineers, U. S. A., has been discharged from the service and has been appointed highway engineer of Thomas County, Georgia.

B. W. Matteson, formerly of the City Engineer's Office of Los Angeles, Cal., is now with the U. S. Bureau of Public Roads, with headquarters at Enterprise, Utah.

F. D. Messenger, who is on inactive duty as an assistant sanitary engineer of the U. S. Public Health Service, has entered the employ of the Michigan State Highway Department as an engineer.

Lieut. George A. Giorloff has been discharged from the service and has become associated with the Towanda Construction Co. as superintending engineer on state highway work near Towanda, Pa.

Charles C. Smith has resigned as city engineer of San Angelo, Texas, to become highway engineer for Schleicher County, Texas, where work is to be done with the proceeds of a bond issue of $125,000.

John Revel has been employed as chief draftsman by the Kentucky Department of Public Roads. For the past year, Mr. Revel has been an assistant engineer on the construction of Camp Knox.

Lloyd Aldrich has been appointed county highway engineer of Sonoma County, California, by the board of supervisors. Mr. Aldrich will have charge of the county's work under a recent bond issue.

Capt. Bruce Aldrich has been appointed district engineer of the Asphalt Association for the Canadian District. His headquarters will be at the office of the H. K. McCann Co., Ltd., Toronto, Ontario. Capt. Aldrich was born in London, England, but came to Canada at an early age and received part of his education in that country. After completing his education in England, he came to the United States and in 1901 was made inspector of asphalts and cements in the Engineer Department of the District of Columbia. In 1912 he went to Baltimore, Md., where he organized and equipped the municipal laboratory and, as inspector of asphalt, supervised the laying of over 3,000,000 sq. yd. of bituminous pavement. Capt. Aldrich served in the United States Army in the Spanish-American and Philippine Wars and also served as a captain of infantry in the Great War.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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*Illustrated Article

Dust Preventives and Road Binders

By PREVOST HUBBARD

Chief, Division of Road Materials Tests and Research, United States Office of Public Roads.
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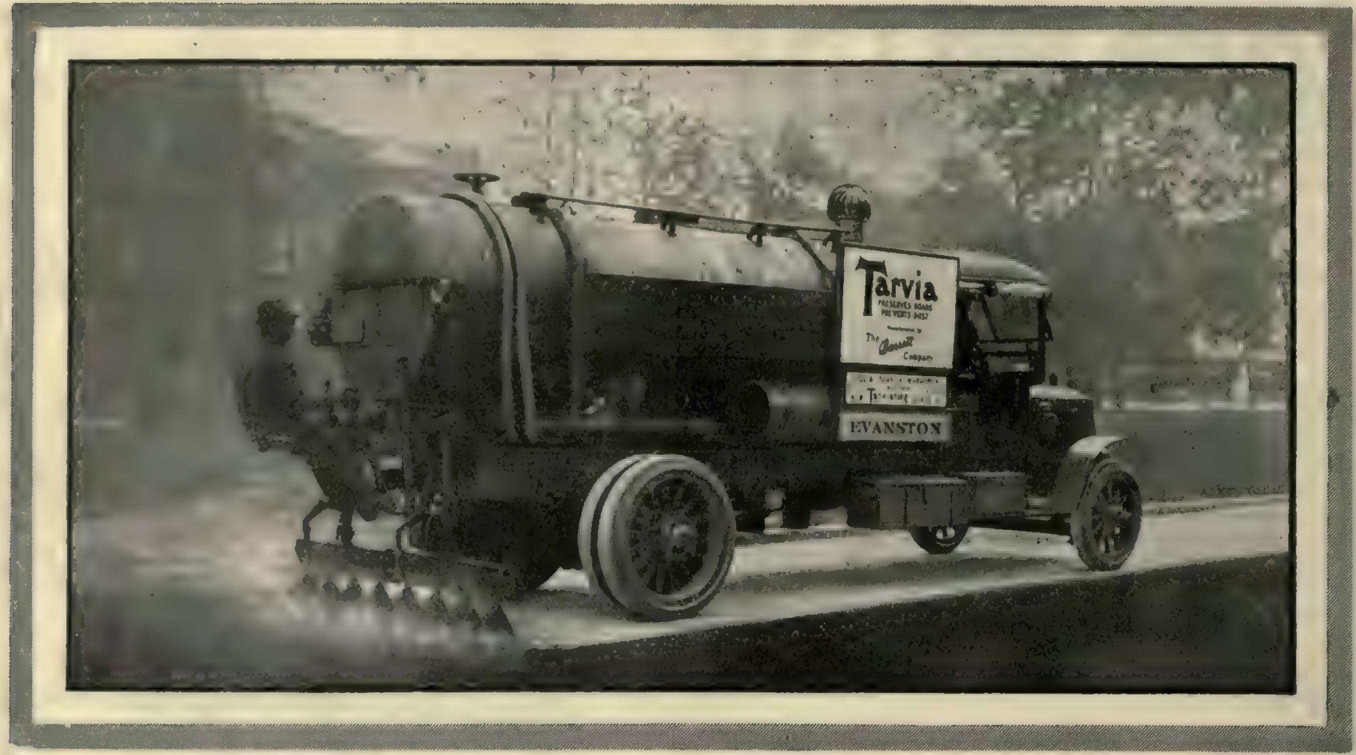

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVI.
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NEW YORK, SEPTEMBER 3, 1919

Number 10

Cantonment Road Building at Camp Lewis—I[*]

Methods and Costs of Building About 22 Miles of Gravel Road and Over 150,000 Square Yards of Warrenite-Bitulithic, with Local Gravel Aggregate, on Bituminous Concrete Foundation

By U. S. MARSHALL[†]

Camp Lewis lies 16 mi. south of Tacoma, Wash., and 2 mi. from Puget Sound. American Lake, a beautiful body of water, surrounded by stately firs, is 3 mi. distant and gives the name to this part of the country, making the title Camp Lewis, American Lake, Washington.

The camp is served in a transportation way by the main line of the Northern Pacific Railroad, running from Portland to Seattle. Over this road, the Great Northern Railroad and the Oregon and Washington Railroad have traffic rights and operate daily trains. Paralleling the railroad, and on the camp side, is the Pacific Highway, a fine paved roadway connecting Tacoma on the north with Olympia on the south, ultimately to be paved throughout the whole extent of the State of Washington.

The maneuver area of the camp consists of 37,000 acres, purchased by the County of Pierce at a cost of $2,000,000 and given to the Government for camp site purposes.

Camp Lewis is the largest National Army camp in the United States, and one of the few camp sites owned by the Government.

The camp has facilities for 50,000 men. Besides this, there is connected with the camp an auxiliary remount depot accommodating 7,000 horses or mules.

Topography

The building site of the camp is on an undulating plain having an average elevation of 300 ft. above sea level.

In common with the land surrounding Puget Sound, it

Lewis Drive, Looking Toward Gate.

Administration Building and Lewis Drive.

BIRD'S-EYE VIEWS OF CAMP LEWIS, AMERICAN LAKE, WASHINGTON.

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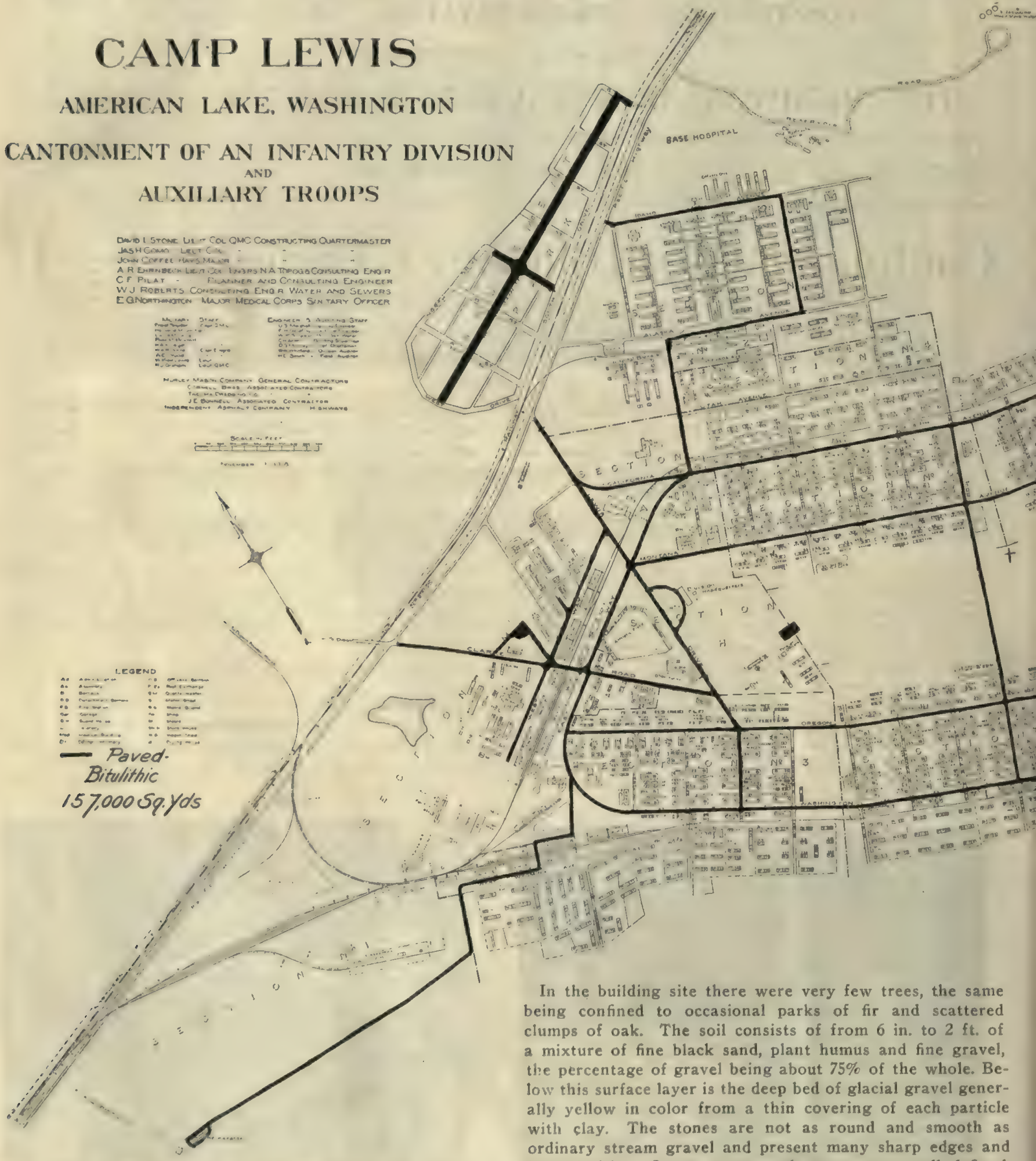
[*] This article is the complete report by U. S. Marshall, the senior highway engineer who had direct charge of the road construction at Camp Lewis during a period of nearly two years. It should be noted that the costs given are considerably below the normal for the kind of work described and that this is due to the fact that they do not include contractor's profits or overhead expenses; to the unusually favorable conditions; to the abnormally low freight rates and to the performance of work by Government forces. Suitable sand and gravel were obtained very near the work; asphalt, cement and fuel were brought in at U. S. Land Grant nominal and in some cases free freight rates; the Government furnished teams and drivers and roller men and did part of the subgrading and the senior highway engineer's services were furnished gratis by the Department of Agriculture. A further saving was effected by the patriotic action of Warren Brothers Company in waiving the payment of royalties on the use of its patents.

[†] Senior Highway Engineer, Bureau of Public Roads, U. S. Department of Agriculture.

is a glacial drift composed of fine gravel and sand at least 200 ft. thick. The camp area is about ¾ mi. wide and 3 mi. long, the longer axis extending from southwest to northeast. The westerly side of the area is bounded by the Pacific Highway and the railroad. The southerly side is bounded by a chain of heavily wooded hills several hundred feet high. The northerly side on the west end is a wooded plain extending to American Lake, while on the east end of this side there extends a broken line of hills standing alone in the plain. On the highest point of these hills are located the reservoirs of the camp water supply.


CAMP LEWIS
AMERICAN LAKE, WASHINGTON
CANTONMENT OF AN INFANTRY DIVISION
AND
AUXILIARY TROOPS
DAVID L STONE LT COL QMC CONSTRUCTING QUARTERMASTER
C F PILAT - PLANNER AND CONSULTING ENGINEER
W J ROBERTS CONSULTING ENGR WATER AND SEWERS
E G NORTHINGTON MAJOR MEDICAL CORPS SANITARY OFFICER
BASE HOSPITAL
LEGEND
Paved-
Bitulithic
157,000 Sq.Yds

Looking along the axis to the east, one sees in the near foreground the low wooded hills extending in a generally north and south line, each distant chain a little higher than the one in front until crowning all is the crest of the Cascade Mountains with the grand Mount Ranier in the very center of the picture.

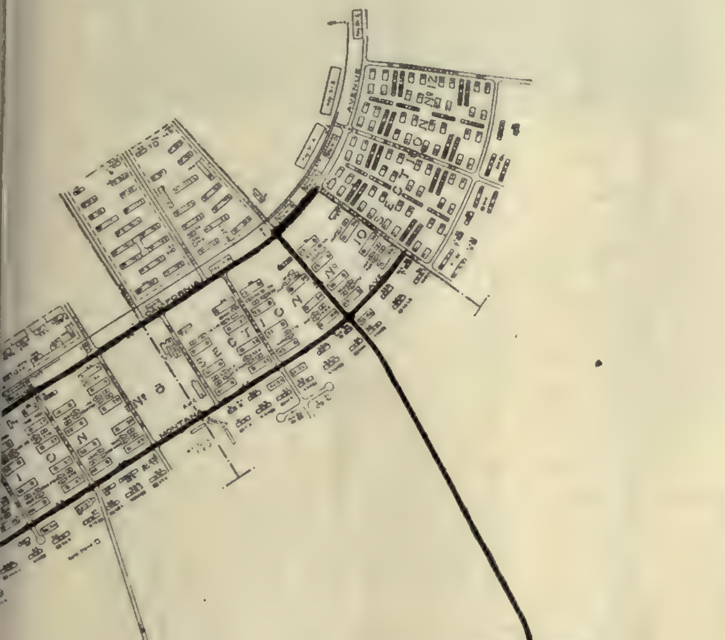
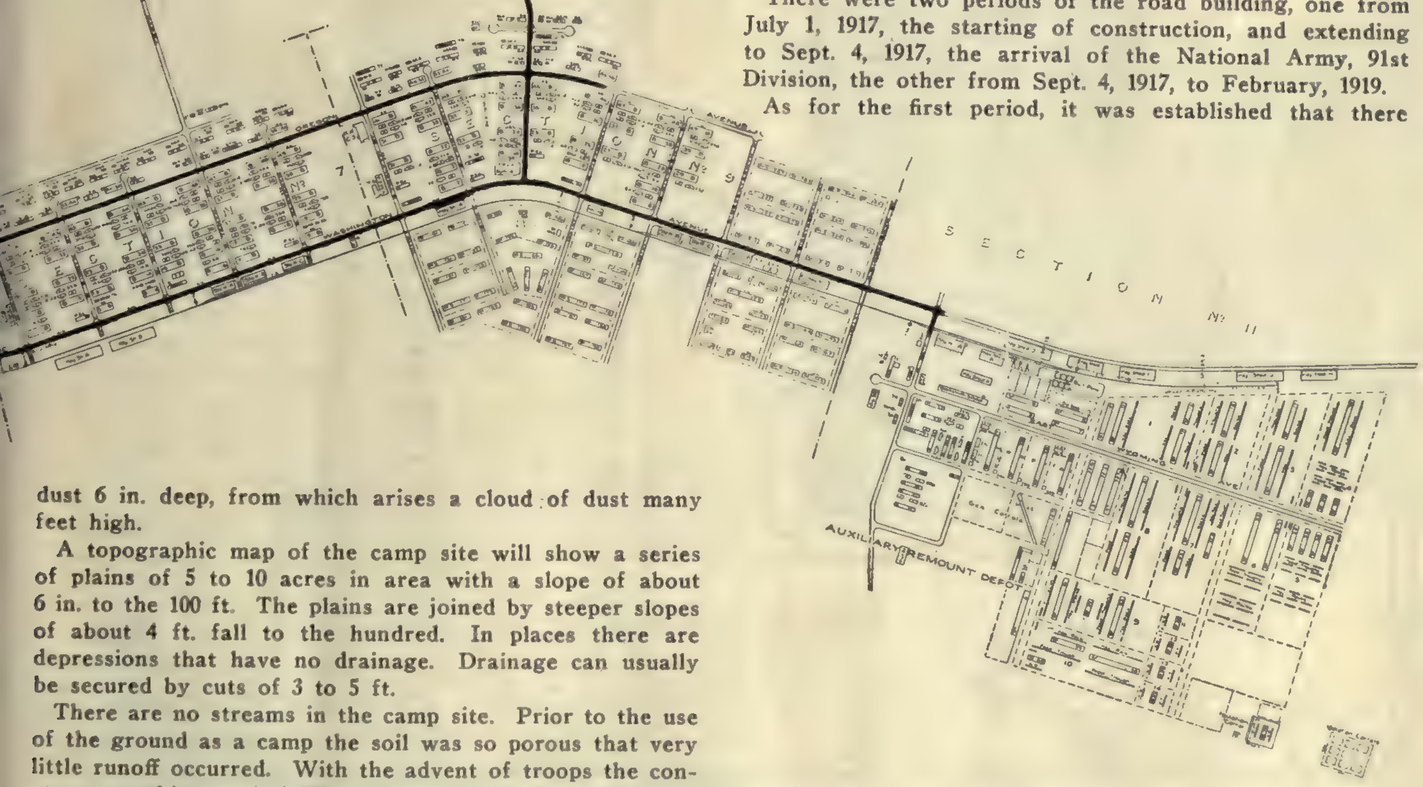
In the building site there were very few trees, the same being confined to occasional parks of fir and scattered clumps of oak. The soil consists of from 6 in. to 2 ft. of a mixture of fine black sand, plant humus and fine gravel, the percentage of gravel being about 75% of the whole. Below this surface layer is the deep bed of glacial gravel generally yellow in color from a thin covering of each particle with clay. The stones are not as round and smooth as ordinary stream gravel and present many sharp edges and irregularities. In many cases the strata are well defined, each stratum containing a heavy percentage of stone of the same size. An occasional boulder several feet in diameter shows, but usually the largest stone is about 6 in. in diameter, and of these sizes scarcely 5% are found.

The plant growth consists of a carpet of trailing vines called "kinni-kinik" and used by the Indians for tobacco, wild strawberry, dandelion and a thin grass. This plant growth forms a carpet with its roots about 6 in. thick. An auto, a truck or wagon can be driven loaded over the site, when dry, with ease. If used much for roads in summer the top breaks up and the roadway becomes a string of dust 6 in. deep, from which arises a cloud of dust many feet high.

A topographic map of the camp site will show a series of plains of 5 to 10 acres in area with a slope of about 6 in. to the 100 ft. The plains are joined by steeper slopes of about 4 ft. fall to the hundred. In places there are depressions that have no drainage. Drainage can usually be secured by cuts of 3 to 5 ft.

There are no streams in the camp site. Prior to the use of the ground as a camp the soil was so porous that very little runoff occurred. With the advent of troops the constant marching and drilling killed the plant growth and compressed the ground to such an extent that, together with the large roof area, it has caused a runoff of perhaps 50% of the rainfall.

Prior to the construction of drainage ditches, which was during the winter of 1917-18, drainage was taken care of in many places by digging drainage pits about 5 ft. deep and from 6x80 ft. to 20x200 ft. in area. These sumps took care of from 4 to 20 cubic second feet of storm water. They required cleaning once during the rainy season.

Grades for Buildings

In the rapid construction of the building of the camp it was not possible to fill the depressions or grade off high spots to what might have been considered a proper grade. It also was not known whether, if a building were located in a low spot, it would have dirt filled around if the building were set higher than the usual 2 ft. 6 in. of the floor above the natural ground; so it was that all buildings were placed about the standard distance above the ground they stood on. Since the buildings were the most important feature, the roads had to conform to them, with the result that in low ground roads were not raised as high as common practice in this line would indicate. But few ill results came from it, for with the heaviest wash rains there were but five or six places where the water ran over the roads and in extent about 2,000 ft.

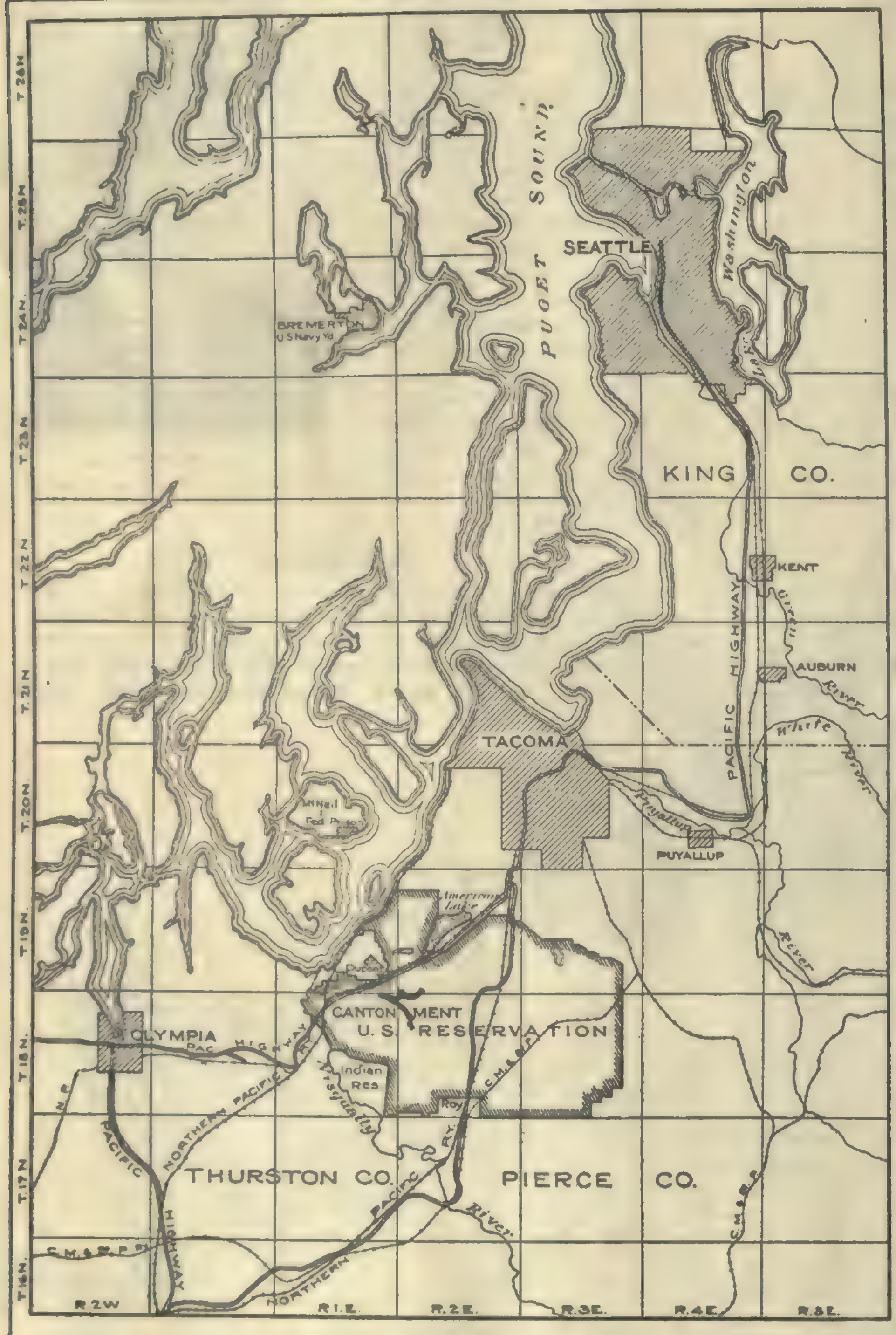
U. S. MARSHALL,
Senior Highway Engineer, Bureau of Public Roads.

Road Building

There were two periods of the road building, one from July 1, 1917, the starting of construction, and extending to Sept. 4, 1917, the arrival of the National Army, 91st Division, the other from Sept. 4, 1917, to February, 1919.

As for the first period, it was established that there would have to be a certain number of houses, the plans of which were already out, that there would have to be a sewer system, and as there is but one standard of sewer construction and it must be a gravity system, this determined the type of construction for that. Similarly, water distribution in the Northwest is exclusively by wooden pipes, so that phase of the camp construction was solved. But as for roads, it seemed they were not considered much. Someone said that the basis of appropriation for roads at the various camps was gotten from the cost of roads per man as expended in the army camps along the Mexican border just prior to America's entrance into the Great War.

However, but $78,000 were appropriated for roads at Camp Lewis, and about 27 mi. were to be built. As this appropriation was to cover roads, wharves, walks and drains, it became certain that no hard surfacing was contemplated in the original estimate for camp construction.



VICINITY MAP
CAMP LEWIS CANTONMENT
Scale in Miles
0 1 2 3 4 5 6 7 8 9 10 11 12

In this first period there was much pioneer road building, clearing of trees, shooting and pulling stumps and team grade work.

The aim throughout was to construct whatever work was done with the ultimate idea of hard surfacing some day. To that end all cuts and fills were made carefully to a center line which was the theoretical center line of street. Profile grades were not used except where the grade of the road depended on a parallel drainage gutter. Otherwise sweeping undulating grades were used, conforming closely to the ground work and so requiring the least amount of earth work.

As mentioned before, the ground surface of the camp was soon cut up by the hundreds of heavy trucks used exclusively to haul material for building construction. This material, being worthless for road surface, had to be removed, and in order to give the trucks usable roads, two 80 hp. gas tractors each drawing a 10-ft. heavy road grader, worked continuously moving this dusty top soil to the sides of the road for a width of 20 ft. and a depth of 6 to 8 in. When this was removed and the cleaner gravel was exposed, a fairly good surface was obtained. Especially was this the case after a water supply was put in operation and sprinkling could be done. But we were never allowed sufficient water for sprinkling, as the temporary water supply just about served the other needs of the camp. However, this shortage of water was soon remedied.

Prior to the taking over of the construction of the road by the U. S. Bureau of Public Roads, working under the Constructing Quartermaster, it seems to have been the idea of the advisers of the Constructing Quartermaster that the roads would be built of crushed rock macadam, and arrangements had been made with various rock crushers to furnish material. This did not seem to be the proper method. In the first place the shortage of cars, track room and labor, to say nothing of the cost, would have made this method slow and expensive. The constructing of gravel roads out of the clean gravel so abundant about the camp was questionable, as the gravel was very deficient in binding material, but well graded. It was finally determined to make graveled roads of the local gravel, and on Aug. 1 a steam shovel was moved into a bank on North 6th St. and trucks and tractors were started hauling gravel. From this pit 120,000 yd. of gravel were hauled to the roads.

Method of Constructing Gravel Roads

The steam shovel used was a ⅞-yd. Thew automatic, having a loading capacity of 800 cu. yd. in 8 hours. Twelve

GRAVEL HOIST AND SCREEN.

3½ and 5 ton capacity self dumping trucks, one 35 hp. gas tractor hauling two 3-yd. spreader wagons and two 85 hp. gas tractors hauling four 4-yd. spreader wagons served the shovel. The large tractors hauled gravel the cheapest. Along the road to be graveled was laid on the surface 2,000 ft. of 2-in. iron pipe with T's every 200 ft. fitted to take a 2-in. hose. Into the cleaned out roadway made by removing the top soil by means of tractor and grader the gravel was dumped. This was spread by Fresno and team. There were also 8 to 12 men, supplied with 5-tined rock rakes, who were kept busy pulling out the over-sized rocks of 5 in. and over and throwing them to side of road to be picked up later by team.

This gravel was spread to the required width, which was never less than 20 ft., and shaped to the cross-section of the road.

It was then given a thorough soaking by means of a 2-in. hose, after which a 10-ton road roller went onto the gravel and rolled continuously. A roller would roll about 800 sq. yd. of gravel road per day. Even with the clean gravel under this rolling a fairly well knitted road was secured.

On this layer, which was 5-in. thick after rolling, there was placed another 5-in. layer which served as the wearing surface. In order to properly bond this layer, it was necessary to drag onto the gravel, after it was properly spread to roll, about 1 in. of the black soil scraped from the original roadway and lying along the side. After spreading this soil, water was again applied, driving the fine material into the gravel. Enough water was applied to cause a ridge of water to form just ahead of the roller as it passed over the gravel. Intensive rolling was then done until the road solidified.

In no instance did this method of making gravel roads fail to secure results. The secret of this type of road was the water and the rolling and the picking of the larger sized rocks out of the surface. The sides were always rolled before the crown.

TYPICAL GRAVEL ROAD AT CAMP LEWIS.

By Sept. 3, 1917, the following road work had been completed:

Graveled roads 80 ft. wide 10 in. of gravel.......	3,000 lin. ft.
Graveled roads 40 ft. wide 10 in. of gravel.......	3,500 lin. ft.
Graveled roads 20 ft. wide 10 in. of gravel.......	28,630 lin. ft.
Total graveled roads..........................	35,130 lin. ft.
Secondary roads, graded only	81,020 lin. ft.
Total roads improved..........................	116,150 lin. ft.

Cost of above roads:

19,500 cu. yd. excav. and embk. (teams) @ 28 ct.......	$5,460.00
28,600 cu. yd. gravel, hauled and spread @ 95 ct......	27,170.00
27,000 cu. yd. tractor grading @ 12 ct.................	3,240.00
46 acres timber clearing and stumping @ $130.......	5,980.00
120,000 sq. yd. fuel oiling temporary roads @ 5 ct.....	6,000.00
Total, exclusive of contractor's profit............	$47,850.00

WARRENITE-BITULITHIC PAVEMENT ON MONTANA AVENUE, CAMP LEWIS, WASHINGTON.

Besides the above, $21,000.00 was spent on grading and draining building sites and camp areas.

For this period the following scale of wages prevailed, based on an eight hour day, time and a half for overtime and double time for Sunday and holidays:

Laborers	$3.00
Teamsters	3.50
Foreman	5.00
General foreman	7.50
Steam roller engineers	7.00
Tractor engineers	6.00
Steam shovel engineers	7.00
Superintendent	12.50
Stock, per head	2.00
Motor trucks	24.00

On the above basis the following raises and fluctuations in wages took place during the construction period of Camp Lewis: July 1 to August, 1917, above scale; Aug. 1 to April 11, 1918, 50 ct. per day added to above and paid as a bonus if workman remained the calendar month;

(Continued on page 124)

Highway Maintenance in Wisconsin—IV[*]

The Upkeep of Surfaced Roads—Methods Employed for Highways of Shale, Pit Run Gravel or Crushed and Screened Gravel

The patrolman's duties and equipment and the general directions and methods aplying to earth road maintenance, covering ditches, drainage, culverts, cutting grass, weeds and brush, apply in a general way to all surfaced roads.

Shale Roads

Shale surfacing has a tendency to pit or pocket out, due to the fact that the material is uneven in quality, and that the softer material, which has less bonding property, will disintegrate and become worn by the traffic and thrown out and away from the wearing surface of the road.

The maintenance consists chiefly of taking care of shoulders, adding new material where needed and using the light grader or planer where necessary.

As the frost is leaving the surface in the spring and after each rain the road grader or planer is used. New material is added where needed to fill the holes and low places. The new material bonds readily to the old surface and care must be taken to spread it evenly. Low places and holes that hold water are very detrimental to shale surfacing.

Shale should receive a light covering of sharp sand or sandy gravel, if available, which will form a reasonably good wearing surface. The clay in the shale will come to the surface during wet weather and assist in bonding the gravel, which, when compacted, will make a very satisfactory wearing surface.

Pit Run Gravel Roads

On all pit run gravel roads there is a tendency for a comb of grass to form just outside the edge of the gravel surface. This collects the finer gravel that is thrown out, the dirt and vegetable matter that is collected on the road surface, and in a short time will form a ridge which will not permit the water to drain away quickly from the gravel surface after each rain. This grass comb should be cut away with a good sharp blade grader before maintenance work on the surface begins.

Time to Do Work.—The proper time to do this work is early in the spring just after the frost has left the ground. At this time the gravel surface is somewhat loosened from the frost action and it is possible to cut off the high places and move them to the low places with more ease than at any other time during the season. The ridge of gravel thrown outside the wheel tracks by the traffic is moved in towards the center of the road with the road grader and naturally fills the ruts, holes and low places. All large stone projecting is removed from the surface before adding new material.

Material.—If additional new material is needed, it must be available along the roadside and added at this time, as it will bond much better and more easily than at any other time during the season. Where new material is needed to fill the holes and low places, if possible use gravel that has passed through a screen having perforations not to exceed ¾ in. in diameter, and containing a reasonable amount of binder.

When the holes and low places have been filled, the entire surface is gone over with a road grader, with the blade set nearly at right angles, until a uniform and even surface is obtained. The blade is then set at the proper angle to shape up the surface to the proper cross-section and, after the road is opened for travel, a light grader or planer is used frequently to fill the ruts, smooth up the surface and assist in compacting the gravel.

Piles of fine gravel for use in maintenance are placed along the road at convenient points outside the ditch line, where patrolmen easily can get material necessary to take care of the small holes and defects that may appear from time to time. The material is delivered to the road by the county with a motor truck or on sleighs during the winter months, provided the haul exceeds 1 mi.

There is no better time for filing the small holes and low places on the surface of a gravel road than immediately after a rain or just as the frost has left the surface in the spring. If the patrolman has material available along the roadside at this time, he can fill the holes immediately in the spring or after a rain and the water standing in the low places will show him better than can be shown in any other way, the exact depth of new material to bring the low places to the proper crown.

Time to Use Grader or Planer.—The best time to use the road grader or planer on a gravel surface is early in the season, just when the frost is leaving the surface, or after a rainy period of several days, at which time the entire surface has become so thoroughly soaked and softened up that material moved from the high places will bond readily where it drops into the low places.

If a gravel road contains large stone projecting above the surface, a lever road drag may be used to better advantage than either the light grader or planer. The blades can be set at an angle that will not remove the coarse stone, but will move the fine gravel that has been thrown out by traffic in towards the center of the road.

Where a patrolman's section is all pit run gravel surfacing, a motor truck or light tractor is often used to good advantage for pulling the road grader or planer. An ordinary 2 or 3-ton motor truck or a light tractor will pull two road planers and do very satisfactory work, and probably more work in a day than can be done with horses. In some sections of the state, teams are not available and motor power must be used. One objection to the motor truck is that operators are inclined to drive too fast, thereby causing the grader or planer to jump when it strikes any hard surface and not leave the smooth, even surface resulting from the use of horses for motor power.

Surface Treatments.—Surface treatment for the ordinary pit run gravel is not advocated. In most cases new material is added where necessary, the surface kept smooth and even by the use of the road grader or planer, and a very satisfactory traveling surface maintained at a much less cost on this type of road than where surface treatments are used.

Pit run gravel surfacing generally runs rather uneven and any loose or mealy spot in the surface of the gravel road is sure to pit out and cause a disagreeable hole after the application of any bituminous material. There are, however, many miles of exceptionally clean pit run gravel roads which are maintained by surface treatment in a very satisfactory manner. As a rule, surface treatment does not remove holes or ruts; therefore, a hole appearing in a surface-treated gravel road is more difficult to repair than one on one not surface-treated.

There have been hundreds of miles of uneven gravel roads built in the past under town supervision, which can be converted into excellent roads for travel by scarifying and

(Continued on page 124)

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[*] From "Highway Maintenance," Bulletin No. 8, Wisconsin Highway Commission, a publication devoted especially to patrol maintenance on the state highway system, compiled by J. T. Donaghey, Maintenance Engineer.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIII **September 3, 1919** **No. 10**

TRAFFIC REGULATIONS TO ENHANCE SAFETY

In order to reduce the number of traffic accidents, the Highways Transport Committee of the Council of National Defense, which some time ago inaugurated a safety campaign, has recently prepared a set of general highway traffic regulations and is giving them wide distribution. The purpose of the regulations is primarily educational, since, as stated by Mr. Eno in the pamphlet being sent out with the regulations: "It can be set down as a traffic axiom that familiarity with the intelligent use of properly printed general highway traffic regulations is the key to effective and economical traffic management." A reproduction of the card bearing the regulations appears on other pages of this issue, together with notes on the explanatory pamphlet.

On a highway traversed by large numbers of motor vehicles and crossed by many pedestrians a variety of accidents can happen. If street cars use the thoroughfare, the possibility of mishaps and the different kinds likely to happen are greatly increased. And if the road is also traversed by people on foot, it becomes still more dangerous for all users. While few heavily traveled roads carry street car, motor vehicle and pedestrian traffic, there are extreme cases where all three are found.

With the exception of those accidents occasioned by mechanical faults in vehicles, practically all accidents can be put into three classes—those involving vehicles and obstructions of one kind or another in the road, those involving two or more vehicles, and those involving pedestrians and vehicles.

In all except those in the first—and least numerous—class, the cause is carelessness of drivers or pedestrians, and in accidents involving pedestrians it is more often the man on foot than the man in the car who is to blame. Most of such carelessness is merely carelessness—lack of care—and nothing more. It comes from ignorance of danger or a disregard of known danger due to preoccupation or inattention, but entirely innocent of the element of callous disregard of others. This cause is one that can very largely be removed by education and to which the Highways Transport Committee is devoting its attention. The work is important and merits the hearty cooperation of public officials in charge of traffic.

A certain proportion of the avoidable accidents are due to a reckless disregard of personal danger and a selfish indifference to the safety of others. This can be checked only by the infliction of severe penalties, and should be dealt with accordingly.

TERMINALS FOR PASSENGER AND FREIGHT MOTOR CAR LINES

A suggestion of more than passing interest is contained in an item headed "The Railroad Station of the Future May Be Wholly or Partly Garage," printed elsewhere in this issue. In an address before the New York Railroad Club, W. E. Symons, a railroad expert, pointed out the possibility of substituting motor truck routes for the unprofitable short-line feeders of the trunk-railroads and indicated some of the changes in terminal facilities that might be expected to follow.

At present, according to Mr. Symons, the passenger station, freight depot, roundhouse and other structures at a terminus are often much more costly than the volume of business warrants. If motor trucks were used these could be replaced by garages that would cost less in the first instance and that could be operated and maintained at less expense.

GRAVEL ROAD MAINTENANCE

For two reasons the fourth installment of the article on maintenance methods in Wisconsin, which appears in this issue and in which the methods of maintaining gravel roads are described in detail, is a particularly important chapter. In the first place, gravel roads make up a large percentage of the "surfaced" roads of the country—according to the figures of the Bureau of Public Roads, for 1914, slightly more than 45%. In the second place, a gravel road is an excellent low cost road when, but only when, properly cared for.

While a system of main roads paved with something more durable and offering less resistance to traction than gravel is the goal towards which our efforts must be bent, there will remain a large mileage of gravel for many years to come. Many main roads are now of gravel construction and they must be maintained until better surfaces can be provided. In addition, there is a still greater mileage of secondary roads surfaced with that material that must also be kept in the best possible condition, probably for an even longer period. These considerations make it imperative that the best methods of upkeep be followed if the gravel roads are to render the service of which they are capable during the time that must intervene before their reconstruction.

While the details of gravel road maintenance vary in different localities, with different kinds of gravel and under differing traffic conditions, there are certain fundamental principles of universal application. One of these—and perhaps the most important—is that of continuous care. Haphazard work or work at long, though perhaps more or less regular, intervals is not productive of good results. The controlling factors in the proper maintenance of gravel roads are attention to drainage and regular and frequent care of the surface. With such upkeep the gravel road provides a satisfactory traffic-way during a considerable portion of the year, even under large numbers of comparatively heavy trucks or of high-speed passenger cars.

HIGHWAY TRANSPORTATION

Highways Transport Committee's General Traffic Regulations

Proposed Regulations and Suggestions for Their Utilization Being Distributed as a Part of the Committee's Safety Campaign

As a part of the safety campaign being conducted by the Highways Transport Committee of the Council of National Defense, to which frequent reference has been made in "Good Roads," the committee is now sending out thousands of cards bearing the suggested regulations, together with copies of a bulletin embodying suggestions for the utilization of the regulations.

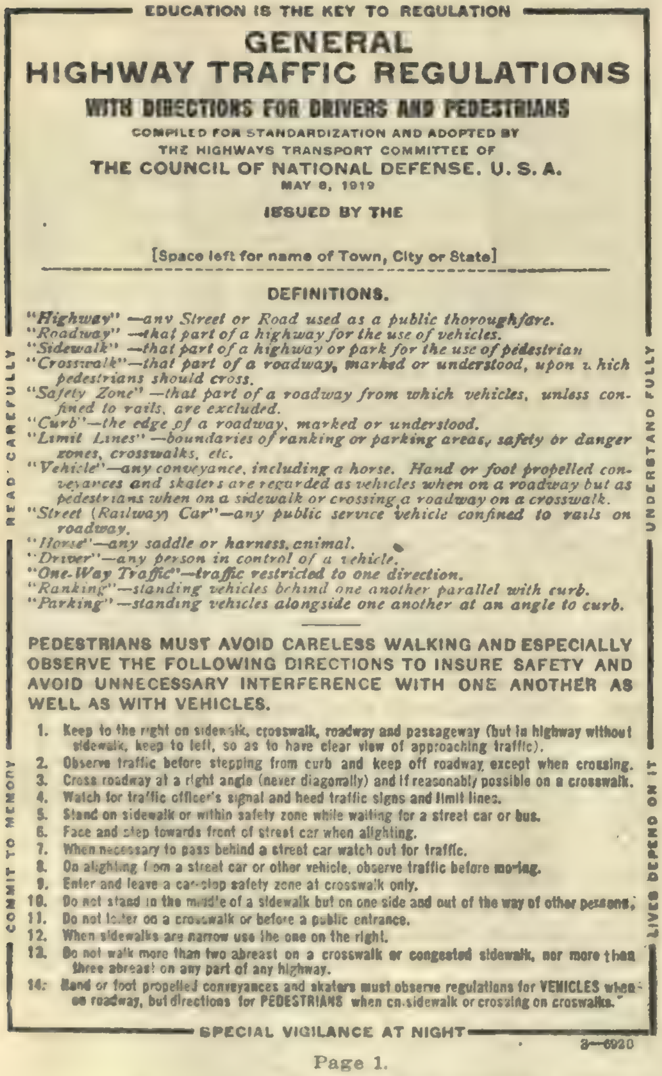
The regulations are printed on a four-page folder 4x6 in. in size, a reproduction of which is shown in the accompanying illustrations. The bulletin which accompanies the regulations consists chiefly of an article by William P. Eno, of the advisory committee of the Highways Transport Committee, who is a well known authority on traffic and its regulation. An article by Mr. Eno containing many of the points made in the bulletin was printed in "Good Roads" early this year. (See "Traffic Regulations and Their Value," by William P. Eno, "Good Roads," Feb. 22, 1919, page 72.)

Mr. Eno recommends that supplies of the regulations be kept on hand at all police stations and that policemen be provided with copies to be given to drivers. He also recommends that provision be made for distributing copies to school children and that teachers require children to study them. Besides the small printed edition of the regulations, large placards about 14x20 in. in size are recommended for display in prominent places in public garages, stables, schools, police station houses and public buildings.

The special suggestions made in connection with the regulations are as follows:

"Note 1, Article 1.—Special stress is here laid on the necessity for caution being exercised at crossings, roadway intersections and junctions, where most of the accidents happen. If there were no other article or section in the regulations, familiarity with an observance of this one doubtless would eliminate the majority of traffic accidents.

"Note 2, Article IV.—Combines the advantages and avoids the faults of the many forms used in various cities. Eight feet is the clearance space required in New York, being all



EDUCATION IS THE KEY TO REGULATION

GENERAL
HIGHWAY TRAFFIC REGULATIONS
WITH DIRECTIONS FOR DRIVERS AND PEDESTRIANS
COMPILED FOR STANDARDIZATION AND ADOPTED BY
THE HIGHWAYS TRANSPORT COMMITTEE OF
THE COUNCIL OF NATIONAL DEFENSE, U. S. A.
MAY 8, 1919

ISSUED BY THE

[Space left for name of Town, City or State]

DEFINITIONS.

"Highway" —*any Street or Road used as a public thoroughfare.*
"Roadway" —*that part of a highway for the use of vehicles.*
"Sidewalk" —*that part of a highway or park for the use of pedestrian*
"Crosswalk"—that part of a roadway, marked or understood, upon which pedestrians should cross.
"Safety Zone" —that part of a roadway from which vehicles, unless confined to rails, are excluded.
"Curb"—the edge of a roadway, marked or understood.
"Limit Lines" —boundaries of ranking or parking areas, safety or danger zones, crosswalks, etc.
"Vehicle"—any conveyance, including a horse. Hand or foot propelled conveyances and skaters are regarded as vehicles when on a roadway but as pedestrians when on a sidewalk or crossing a roadway on a crosswalk.
"Street (Railway) Car"—any public service vehicle confined to rails on roadway.
"Horse"—any saddle or harness animal.
"Driver"—any person in control of a vehicle.
"One-Way Traffic"—traffic restricted to one direction.
"Ranking"—standing vehicles behind one another parallel with curb.
"Parking" —standing vehicles alongside one another at an angle to curb.

PEDESTRIANS MUST AVOID CARELESS WALKING AND ESPECIALLY OBSERVE THE FOLLOWING DIRECTIONS TO INSURE SAFETY AND AVOID UNNECESSARY INTERFERENCE WITH ONE ANOTHER AS WELL AS WITH VEHICLES.

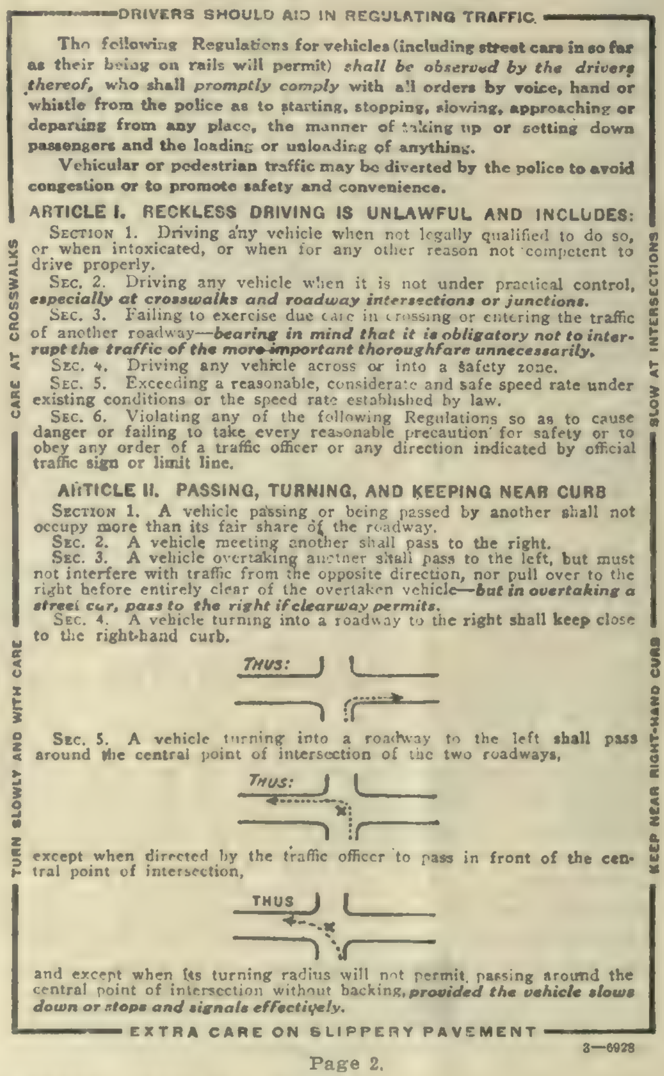
1. Keep to the right on sidewalk, crosswalk, roadway and passageway (but in highway without sidewalk, keep to left, so as to have clear view of approaching traffic).
2. Observe traffic before stepping from curb and keep off roadway except when crossing.
3. Cross roadway at a right angle (never diagonally) and if reasonably possible on a crosswalk.
4. Watch for traffic officer's signal and heed traffic signs and limit lines.
5. Stand on sidewalk or within safety zone while waiting for a street car or bus.
6. Face and step towards front of street car when alighting.
7. When necessary to pass behind a street car watch out for traffic.
8. On alighting from a street car or other vehicle, observe traffic before moving.
9. Enter and leave a car-stop safety zone at crosswalk only.
10. Do not stand in the middle of a sidewalk but on one side and out of the way of other persons.
11. Do not loiter on a crosswalk or before a public entrance.
12. When sidewalks are narrow use the one on the right.
13. Do not walk more than two abreast on a crosswalk or congested sidewalk, nor more than three abreast on any part of any highway.
14. Hand or foot propelled conveyances and skaters must observe regulations for VEHICLES when on roadway, but directions for PEDESTRIANS when on sidewalk or crossing on croswalks."

READ CAREFULLY
COMMIT TO MEMORY
UNDERSTAND FULLY
LIVES DEPEND ON IT

SPECIAL VIGILANCE AT NIGHT

3—6920

Page 1.



DRIVERS SHOULD AID IN REGULATING TRAFFIC.

The following Regulations for vehicles (including street cars in so far as their being on rails will permit) *shall be observed by the drivers thereof,* who shall *promptly comply* with all orders by voice, hand or whistle from the police as to starting, stopping, slowing, approaching or departing from any place, the manner of taking up or setting down passengers and the loading or unloading of anything.

Vehicular or pedestrian traffic may be diverted by the police to avoid congestion or to promote safety and convenience.

ARTICLE I. RECKLESS DRIVING IS UNLAWFUL AND INCLUDES:

SECTION 1. Driving any vehicle when not legally qualified to do so, or when intoxicated, or when for any other reason not competent to drive properly.

SEC. 2. Driving any vehicle when it is not under practical control, ***especially at crosswalks and roadway intersections or junctions.***

SEC. 3. Failing to exercise due care in crossing or entering the traffic of another roadway—***bearing in mind that it is obligatory not to interrupt the traffic of the more important thoroughfare unnecessarily.***

SEC. 4. Driving any vehicle across or into a safety zone.

SEC. 5. Exceeding a reasonable, considerate and safe speed rate under existing conditions or the speed rate established by law.

SEC. 6. Violating any of the following Regulations so as to cause danger or failing to take every reasonable precaution for safety or to obey any order of a traffic officer or any direction indicated by official traffic sign or limit line.

ARTICLE II. PASSING, TURNING, AND KEEPING NEAR CURB

SECTION 1. A vehicle passing or being passed by another shall not occupy more than its fair share of the roadway.

SEC. 2. A vehicle meeting another shall pass to the right.

SEC. 3. A vehicle overtaking another shall pass to the left, but must not interfere with traffic from the opposite direction, nor pull over to the right before entirely clear of the overtaken vehicle—***but in overtaking a street car, pass to the right if clearway permits.***

SEC. 4. A vehicle turning into a roadway to the right shall keep close to the right-hand curb.

SEC. 5. A vehicle turning into a roadway to the left shall pass around the central point of intersection of the two roadways,

except when directed by the traffic officer to pass in front of the central point of intersection,

and except when its turning radius will not permit passing around the central point of intersection without backing, ***provided the vehicle slows down or stops and signals effectively.***

CARE AT CROSSWALKS
TURN SLOWLY AND WITH CARE
SLOW AT INTERSECTIONS
KEEP NEAR RIGHT-HAND CURB

EXTRA CARE ON SLIPPERY PAVEMENT

3—6928

Page 2.

HIGHWAYS TRANSPORT COMMITTEE'S TRAFFIC REGULATIONS FOLDER.

necessary for one line of vehicles and, therefore, logical and reasonable. Making this space more than 8 ft. is unreasonable, and, therefore, unenforceable. It has a tendency to tempt drivers to speed up just before a street car stops and at a place where the street car obstructs their view of vehicles coming through the cross streets. This has caused many collisions at intersections.

"Note 3, Article V.—The general clause on right of way has been omitted to secure greater safety, which is obtainable only through care exercised at crosswalks, intersections and junctions. (See Article 1.) The elimination of the right-of-way clause has been decided upon only after exhaustive attempts to give everyone a chance to express an opinion, and in the scores of letters received there has been no protest against it.

"The rule in New York of giving right of way to vehicles going north and south over those going east and west is fairly satisfactory there, and that of giving the right of way to a vehicle on the right works well enough when the traffic is light, but if carried out where traffic is dense it results in an inevitable and immediate tie-up, besides giving over-importance to traffic on small streets over that on thoroughfares. After all is said, there seems to be a consensus of opinion of those competent to judge that it is far safer to do without any general clause on right of way."

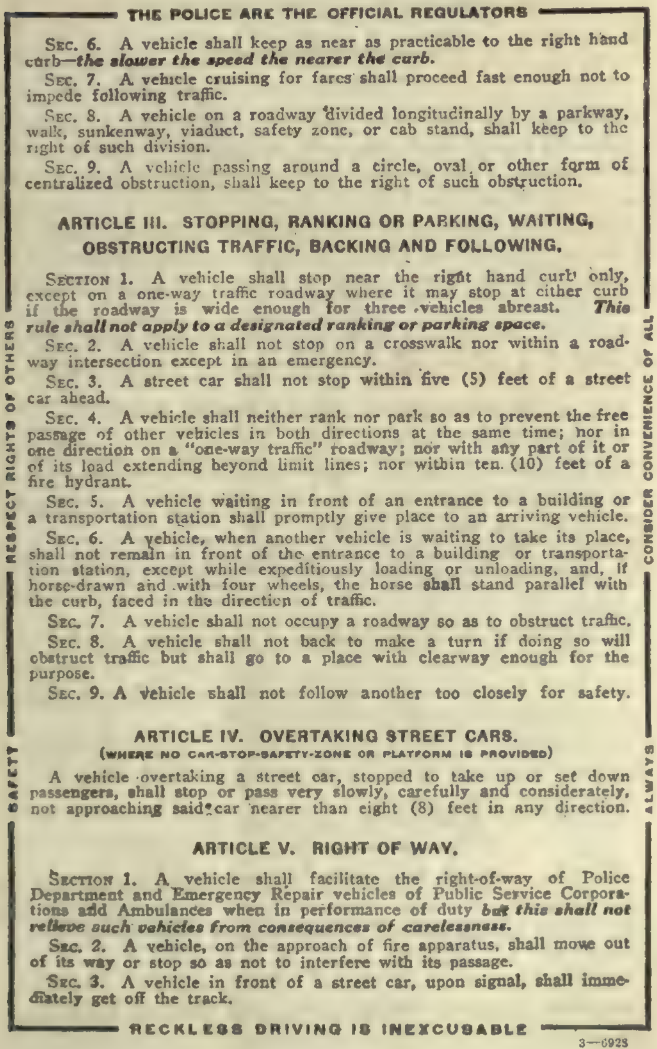
It is announced that the Highways Transport Committee is attempting to make arrangements to supply towns, cities and states with plates from which the regulations may be printed, with the name of the town, city or state inserted in the space reserved therefor on page 1.

The Railroad Station of the Future May Be Wholly or Partly Garage

Railroad Expert Foresees Elimination of Large and Costly Branch-Line Terminals

The branch-line railroad station of the future may be either wholly or partly a garage, according to a statement made by W. E. Symons, a railroad expert, at a recent meeting of the New York Railroad Club. In discussing the suggestion that the railroads should consider seriously the use of motor trucks on short line feeders conducted at a loss, he said, in part:

"It is well known that on branch lines, particularly at the extreme end of the branch line, the railroad company is usually required to spend a great deal of money for a passenger station, freight depot, roundhouse, yards, turntable, water tank and other terminal facilities—expenses which, as a rule, are far in excess of what the volume of business would warrant. Local pride prompts the citizens to request or demand that the buildings be of a character that will conform to the general style of architecture in the town, and, as a rule, they are much larger than should be required for the volume of business handled.



THE POLICE ARE THE OFFICIAL REGULATORS

SEC. 6. A vehicle shall keep as near as practicable to the right hand curb—***the slower the speed the nearer the curb.***

SEC. 7. A vehicle cruising for fares shall proceed fast enough not to impede following traffic.

SEC. 8. A vehicle on a roadway divided longitudinally by a parkway, walk, sunkenway, viaduct, safety zone, or cab stand, shall keep to the right of such division.

SEC. 9. A vehicle passing around a circle, oval or other form of centralized obstruction, shall keep to the right of such obstruction.

ARTICLE III. STOPPING, RANKING OR PARKING, WAITING, OBSTRUCTING TRAFFIC, BACKING AND FOLLOWING.

SECTION 1. A vehicle shall stop near the right hand curb only, except on a one-way traffic roadway where it may stop at either curb if the roadway is wide enough for three vehicles abreast. ***This rule shall not apply to a designated ranking or parking space.***

SEC. 2. A vehicle shall not stop on a crosswalk nor within a roadway intersection except in an emergency.

SEC. 3. A street car shall not stop within five (5) feet of a street car ahead.

SEC. 4. A vehicle shall neither rank nor park so as to prevent the free passage of other vehicles in both directions at the same time; nor in one direction on a "one-way traffic" roadway; nor with any part of it or of its load extending beyond limit lines; nor within ten (10) feet of a fire hydrant.

SEC. 5. A vehicle waiting in front of an entrance to a building or a transportation station shall promptly give place to an arriving vehicle.

SEC. 6. A vehicle, when another vehicle is waiting to take its place, shall not remain in front of the entrance to a building or transportation station, except while expeditiously loading or unloading, and, if horse-drawn and with four wheels, the horse shall stand parallel with the curb, faced in the direction of traffic.

SEC. 7. A vehicle shall not occupy a roadway so as to obstruct traffic.

SEC. 8. A vehicle shall not back to make a turn if doing so will obstruct traffic but shall go to a place with clearway enough for the purpose.

SEC. 9. A vehicle shall not follow another too closely for safety.

ARTICLE IV. OVERTAKING STREET CARS.

(WHERE NO CAR-STOP-SAFETY-ZONE OR PLATFORM IS PROVIDED)

A vehicle overtaking a street car, stopped to take up or set down passengers, shall stop or pass very slowly, carefully and considerately, not approaching said car nearer than eight (8) feet in any direction.

ARTICLE V. RIGHT OF WAY.

SECTION 1. A vehicle shall facilitate the right-of-way of Police Department and Emergency Repair vehicles of Public Service Corporations and Ambulances when in performance of duty ***but this shall not relieve such vehicles from consequences of carelessness.***

SEC. 2. A vehicle, on the approach of fire apparatus, shall move out of its way or stop so as not to interfere with its passage.

SEC. 3. A vehicle in front of a street car, upon signal, shall immediately get off the track.

RECKLESS DRIVING IS INEXCUSABLE

RESPECT RIGHTS OF OTHERS

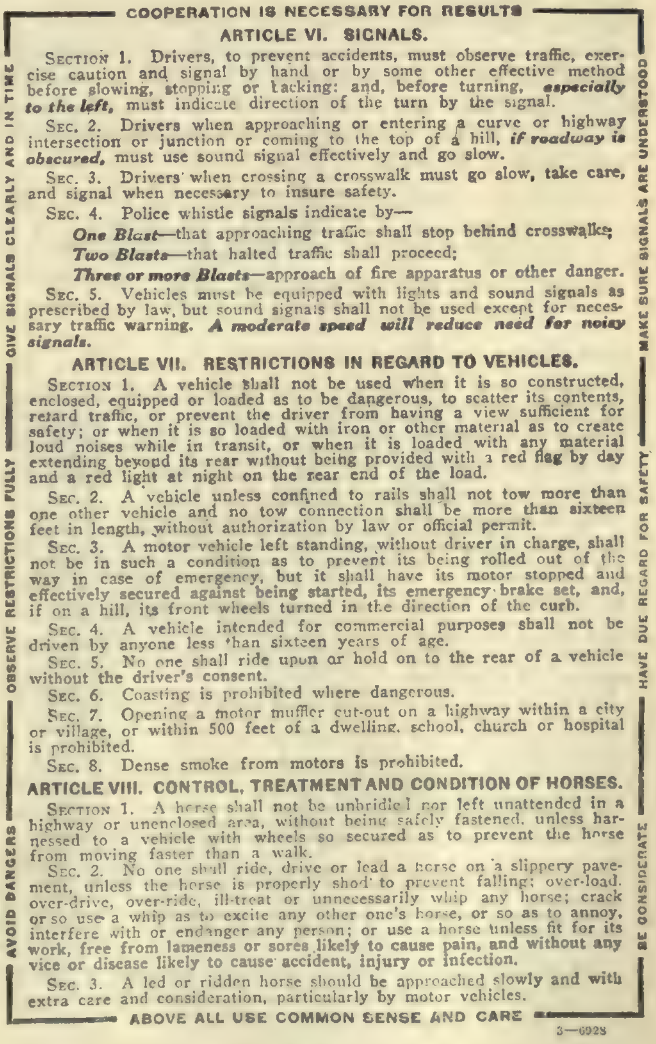
SAFETY

CONSIDER CONVENIENCE OF ALL

ALWAYS

3—6923

Page 3.



COOPERATION IS NECESSARY FOR RESULTS

ARTICLE VI. SIGNALS.

SECTION 1. Drivers, to prevent accidents, must observe traffic, exercise caution and signal by hand or by some other effective method before slowing, stopping or backing: and, before turning, ***especially to the left,*** must indicate direction of the turn by the signal.

SEC. 2. Drivers when approaching or entering a curve or highway intersection or junction or coming to the top of a hill, ***if roadway is obscured,*** must use sound signal effectively and go slow.

SEC. 3. Drivers when crossing a crosswalk must go slow, take care, and signal when necessary to insure safety.

SEC. 4. Police whistle signals indicate by—

One Blast—that approaching traffic shall stop behind crosswalks;

Two Blasts—that halted traffic shall proceed;

Three or more Blasts—approach of fire apparatus or other danger.

SEC. 5. Vehicles must be equipped with lights and sound signals as prescribed by law, but sound signals shall not be used except for necessary traffic warning. ***A moderate speed will reduce need for noisy signals.***

ARTICLE VII. RESTRICTIONS IN REGARD TO VEHICLES.

SECTION 1. A vehicle shall not be used when it is so constructed, enclosed, equipped or loaded as to be dangerous, to scatter its contents, retard traffic, or prevent the driver from having a view sufficient for safety; or when it is so loaded with iron or other material as to create loud noises while in transit, or when it is loaded with any material extending beyond its rear without being provided with a red flag by day and a red light at night on the rear end of the load.

SEC. 2. A vehicle unless confined to rails shall not tow more than one other vehicle and no tow connection shall be more than sixteen feet in length, without authorization by law or official permit.

SEC. 3. A motor vehicle left standing, without driver in charge, shall not be in such a condition as to prevent its being rolled out of the way in case of emergency, but it shall have its motor stopped and effectively secured against being started, its emergency brake set, and, if on a hill, its front wheels turned in the direction of the curb.

SEC. 4. A vehicle intended for commercial purposes shall not be driven by anyone less than sixteen years of age.

SEC. 5. No one shall ride upon or hold on to the rear of a vehicle without the driver's consent.

SEC. 6. Coasting is prohibited where dangerous.

SEC. 7. Opening a motor muffler cut-out on a highway within a city or village, or within 500 feet of a dwelling, school, church or hospital is prohibited.

SEC. 8. Dense smoke from motors is prohibited.

ARTICLE VIII. CONTROL, TREATMENT AND CONDITION OF HORSES.

SECTION 1. A horse shall not be unbridled nor left unattended in a highway or unenclosed area, without being safely fastened, unless harnessed to a vehicle with wheels so secured as to prevent the horse from moving faster than a walk.

SEC. 2. No one shall ride, drive or lead a horse on a slippery pavement, unless the horse is properly shod to prevent falling; over-load, over-drive, over-ride, ill-treat or unnecessarily whip any horse; crack or so use a whip as to excite any other one's horse, or so as to annoy, interfere with or endanger any person; or use a horse unless fit for its work, free from lameness or sores likely to cause pain, and without any vice or disease likely to cause accident, injury or infection.

SEC. 3. A led or ridden horse should be approached slowly and with extra care and consideration, particularly by motor vehicles.

ABOVE ALL USE COMMON SENSE AND CARE

GIVE SIGNALS CLEARLY AND IN TIME

OBSERVE RESTRICTIONS FULLY

AVOID DANGERS

MAKE SURE SIGNALS ARE UNDERSTOOD

HAVE DUE REGARD FOR SAFETY

BE CONSIDERATE

3—6928

Page 4.

HIGHWAYS TRANSPORT COMMITTEE'S TRAFFIC REGULATIONS FOLDER.

"By the use of motor trucks the terminal facilities would practically consist of what might be called a garage for the motor trucks with a very limited amount of labor employed. This would consist of a mechanic or two. The depot facilities could be very limited, as it could easily be arranged within a reasonable radius of the center of the town to deliver passengers carried to their homes, possibly providing a slight extra charge where the residence or point of delivery was some considerable distance from the station.

"This would also be true with respect to freight which could be on the basis of warehouse door delivery, which would materially reduce the expenses on the part of the transportation company and give the patrons much better service."

To Test Truck Impact Upon Roads

Bureau of Public Roads Announces Series of Tests to Determine the Effects Upon Pavements of the Impact of Motor Trucks

A series of experiments to determine the effect of heavily loaded motor trucks on roads and streets is being conducted by the Bureau of Public Roads to meet the demand for data on the design of road surfaces and foundations to withstand such traffic. The work is being done at the Arlington Experimental Farm and consists of tests to determine the impact of motor trucks upon pavements.

The enormous increase in motor truck traffic is characterized by the bureau as the most striking development in the highway field in 1918. It is pointed out that while five years ago heavy trucks were few in number and were found almost entirely on the paved streets of the larger cities, vehicles of this type now compose from 4 to 5% of all motor vehicles and are found wherever traffic conditions make it possible to use them profitably.

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Cantonment Road Building at Camp Lewis

(Continued from page 119)

April 11, 1918, to Aug. 1, 1918, 50 ct. raise and 50 ct. bonus added; August 1 to Oct. 1, $1.00 raise and 50 ct. per day bonus; Oct. 1 to Nov. 18, $1.50 raise per day, making $4.50 per day for common labor; Nov. 18 to date, a cut of 50 ct. per day, making $4.00 per day for common labor. These raises covered all classes of labor.

The following tools and equipment were rented and used in our first road construction period. A daily rental was paid for same. The Government was paid for all upkeep and operating charges, such as fuel, oil waste, etc.

Thew steam shovel	$30.00	per	day
2 50-80 hp. Avery gas tractors rental one at	15.00		
and one at	18.00	"	"
1 25-35 hp. Avery gas tractor, rental	18.00	"	"
3 Giant Western, 10-ft. blade, road graders	2.00	"	"
12 3½-ton dumping auto trucks, with drivers	3.00	"	hr.
2 10-ton Buffalo-Pitts road rollers	200.00	"	mo.
1 Austin gas roller	6.00	"	day
2 Railroad asphalt plants on yard basis	0.80	"	yd.
1 Gravel elevator and gas engine	1.00	"	day
1 Gravel elevator and gas engine	3.00	"	"
6 6-cu. yd. gravel tractor spreader wagons	2.00	"	"
12 3-cu. yd. gravel tractor spreader wagons	2.00	"	"

Form of Contract and Administration of Work

The construction work at Camp Lewis was let to private contractors on a cost plus basis. There was a sliding scale of percentage profit dependent on the gross amount of the work done. Besides this there was a fixed limit to the profit a contractor could receive.

For the road work the profit allowed was 7%, if gross cost was $250,000 or under, and 6½% if over this amount. This percentage was paid on gross payrolls, stock purchases, rentals and insurance. Besides this, the Government paid all industrial insurance, etc. Labor was paid weekly by check of the contractor, who was in turn compensated for his payroll by the Government, together with 3½% allowed profit, the remaining profit to be paid on the completion of the job.

The method of handling accounts was as follows: The field auditor, the accounting department of the Constructing Quartermaster Department, furnished all time-keepers who in turn made out all payrolls. These time-keepers were on the field auditor's payroll and had sole charge of keeping time and paying labor. Checks for the amount due each man were made by contractors' force from payrolls.

Stock purchases were made by the contractor after approval of requisition by representative of Constructing Quartermaster. In the case of road contract, this was done by the U. S. Highway Engineer, and for the building contract the Constructing Quartermaster approved requisitions.

All deliveries of goods were made to the Government warehouse in charge of field auditors' men, who checked quantity and kind.

Sellers were required to make four invoices with all sales. Two of these were sent to field auditor and two were sent to contractor.

(To be continued)

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Highway Maintenance in Wisconsin—IV

(Continued from page 120)

reshaping. An ordinary heavy scarifier pulled by a heavy tractor is used. It is generally advisable to scarify to the entire depth of the gravel. Harrow thoroughly with a heavy peg-tooth harrow and shape up the surface with the light grader. The blade should be set nearly at right angles in order to remove the waves and depressions. Remove loose stones from the surface and, if a roller or heavy tractor is available, run it over the surface a few times to assist in compacting the gravel; if not, use the planer daily until the surface is well bonded. Add fine gravel where needed.

Crushed and Screened Gravel Roads

Properly constructed crushed and screened gravel roads should receive a surface treatment and be maintained by the patrolman in practically the same manner as described later for stone macadam roads.

If they are not properly constructed, the surface should be maintained in the same manner as suggested for pit run gravel.

If the crushed gravel forming the wearing surface of a road is well interlocked and bonded, the voids not overfilled with fine material, and the surface hard and smooth, the road may be considered well built.

Where local gravel is crushed, an extra supply should be crushed to a size that will pass through a ¾-in. ring and left available for future use.

(To be continued)

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An Extraordinary Session of the Montana Legislature has been called by Governor Stewart. One of the matters to be considered is the raising of money for road work.

A Bond Issue of $350,000 in Jasper County, Missouri, is under consideration. It is proposed to use the funds from the issue for the construction of concrete highways completing the cross-county route.

Bond Issue Campaign in Cook County, Illinois

The Associated Road Organizations of Chicago and Cook County Conducting an Active Campaign for $5,000,000 Issue

The Associated Roads Organizations of Chicago and Cook County, Ill., are carrying on an active campaign for a $5,000,000 county road bond issue which will be voted upon at the November election. At a recent meeting at Arlington Heights the following resolutions were adopted:

WHEREAS, under the plan adopted by Illinois to assure the immediate use of $12,000,000 federal aid money on the highways of this state, there will be no funds available until 1921 for the continuation of a comprehensive plan of development on the roads of Cook County; and

WHEREAS, the public has observed the important commercial and social benefits resulting from previous bond issues of $3,000,000 spent on permanent good roads; therefore be it

RESOLVED by the representatives of the fourteen towns and townships assembled at the good roads meeting at Arlington Heights, that we hereby endorse a plan for the issuance of $5,000,000 county good roads bonds to be voted on at the election next November, the money from said bonds to carry through a construction program of approximately two years, at the end of which time the $60,000,000 state bond issue will be available to continue the work.

The towns represented at the meeting were: Palatine, Desplaines, Mt. Prospect, Wheeling, Elk Grove, Maine, Arlington Heights, Evanston, Glencoe, New Trier, Niles, Niles Center, Norwood Park and Chicago.

Other meetings have been held at various points in the county, and it is planned to continue the work in the towns outside of Chicago before the campaign is carried into that city.

Road Building Course at the University of Michigan

Statement of Work To Be Done in the New Courses Under Professor A. H. Blanchard

As has been noted in a previous issue, a course in highway engineering has been established at the University of Michigan and Arthur H. Blanchard has been appointed to the chair of highway engineering.

Four years ago the university commenced the development of work in highway engineering and considerable progress has been made under Prof. John J. Cox, who recently resigned to devote his entire time to construction work. Under the new plan, a large program will be carried out which will include the continuation of all work formerly given undergraduate students in highway engineering, together with one or two new courses. The work will include, not only the usual work in construction and maintenance subjects, but also a course in highway transport and highway economics.

In addition to the undergraduate courses, there will be special graduate courses during the winter months and also a number of shorter graduate courses leading to the degree of master of science in engineering, on the same basis as at Columbia University in connection with the former graduate course in highway engineering at that institution.

All of the testing of road materials for the Michigan State Highway Department will be done in the Highway Engineering Laboratory of the University of Michigan.

John H. Bateman, B. C. E., a graduate of the University of Michigan and for the past four years assistant engineer and engineer with the Michigan State Highway Commission, will be assistant professor of highway engineering in charge of design, laboratory and field work. Liberal appropriations have been made for equipment and for the salaries of clerical and laboratory assistants.

Highway Expenditures in 1918

Total of $300,000,000 Expended for Road and Bridge Work in 44 States During the Year of 1918, According to the Bureau of Public Roads, Department of Agriculture

There has been a steady increase in the federal aid business of the Bureau of Public Roads each month since early in 1919, according to the Office of Information of the U. S. Department of Agriculture, and all indications point to still more extensive work in the months to come.

"Based on complete reports from 44 of the states," according to the statement, "cash expenditures on the rural roads and bridges of the United States for the calendar year 1918 amounted to $286,098,193. To this should be added the value of statute and convict labor, which can not be fixed with any great degree of accuracy but probably amounted to not less than $14,000,000, thus making the grand total expenditures for the year $300,000,000. This total is made up of the actual expenditures for such items as labor, materials, supervision and administration directly connected with the construction, improvement, and upkeep of public roads and bridges outside the limits of incorporated towns and cities, and does not include any item for sinking fund payments or redemption and interest on road and bridge bonds.

"The year 1918 offered an unprecedented condition in practically all lines of highway work. There was not only a tremendous increase and expansion in the amount of heavy truck traffic on public roads and an unprecedented shortage in regard to road materials, labor and ready funds, but also a decided increase in maintenance work, which was, however, partially offset by a decrease in the amount of new construction.

The Massachusetts Highway Commission is having the automobile number plates for 1920 manufactured at the State Prison at Charlestown. Early this month several thousand had already been received and stored, the plates being sent from the prison in small motor trucks.

Illinois Road Work has attracted widespread attention of late, according to reports. Robert Duncan, of the firm of Duncan & Frazier, Ltd., Adelaide, Australia, recently visited Chicago to study road building methods. He is touring America as a special government commissioner on road building and city planning, and while in Chicago conferred with President Wm. G. Edens, of the Illinois Highway Improvement Association. That association has also received inquiries from the Calgary Good Roads Association, of Alberta, Canada, and from the Board of Public Works of the City of Tokio. In addition, many of the states have been supplied with data on the Illinois bond issue.

The University of Texas has recently announced that the bureau heretofore known as the Bureau of Municipal Research and Reference will hereafter be designated the Bureau of Government Research. The change in name will not affect the work that the bureau has been doing for the cities of the state, but, because of the close relationship between municipal government and state and county governments, the latter will be included in the field of the bureau's activities. The bureau will also remain the secretariat of the League of Texas Municipalities, and its publications will be continued under the name "Government Research Series." The bureau is situated at the University of Texas, at Austin.

MEETINGS

Calendar of Coming Meetings

Nov. 12-14—American Society of Municipal Improvements. —Annual convention, New Orleans, La. Secretary, Charles Carroll Brown, 304 East Walnut St., Bloomington, Ill.

Feb. 9-13, 1920—American Road Builders' Association— Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

North Carolina Good Roads Association

The 20th annual convention of the North Carolina Good Roads Association was held at the Auditorium, Harbor Island, Wrightsville Beach, N. C., on Wednesday, Thursday and Friday, August 13, 14 and 15, with an attendance of about 275. The State Association of County Commissioners and the North Carolina Automobile Association held meetings at the same time and place.

The first session was devoted chiefly to the addresses of welcome and responses, to the presentation of reports by officers and committees and to other preliminary business. The remainder of the program was carried out practically as given in "Good Roads" for August 6.

The convention was welcomed on behalf of the City of Wrightsville by Mayor Thomas H. Wright, and on behalf of the City of Wilmington by Roger Moore, President of the Wilmington Chamber of Commerce. The responses were made by A. M. McDonald, Acting President of the State Association of County Commissioners; H. B. Varner, ex-President of the North Carolina Good Roads Association; and C. M. Vanstory, President of the North Carolina Automobile Association.

President Vanstory's report reviewed the work done by the association in securing the passage of the state road law and outlined the work done by the president in attending meetings and making addresses in various parts of the state. He also called attention to the progress made in road work in North Carolina, stating that during the past four months the counties and townships of the state had voted approximately $20,000,000 in bonds for road work. In referring to the future activities of the organization, he suggested the need of further legislation, especially that which would provide for the construction of a system of hard-surfaced highways connecting the county seats and the principal cities. He also urged that the association go on record as favoring a national system of highways constructed and maintained by the Federal Government.

The secretary's report, presented by Miss H. M. Berry, who has served as acting secretary in the absence of Col. Joseph Hyde Pratt, the secretary, referred in detail to the activities of the organization during the past year.

Other reports presented at the meeting included a report of the legislative committee and a report by the committee for revision of constitution. The latter submitted a revised draft which was adopted.

Among the resolutions reported by the Resolutions Committee and adopted by the convention, were the following:

WHEREAS, It is believed that the time has come for a more definite and efficient classification of our public highways into national, state and county highways; and

WHEREAS, The State of North Carolina has already begun the building of a system of state highways through the use of federal, state and county funds; and

WHEREAS, It is believed that further legislation is vitally needed to stabilize a state policy for constructing and maintaining such a system of state highways within a reasonable time and built of such types of pavement as will meet traffic conditions; and

WHEREAS, The counties have shown their willingness to provide ample means for the construction of their systems of highways;

THEREFORE, BE IT RESOLVED: That the State of North Carolina should now adopt a policy with reference to its state highways system that will attain at the earliest possible date a system of state highways connecting all county seats and principal towns of the state by hard-surfaced roads, to be built and maintained by the state and federal funds, exclusive of county cooperation.

RESOLVED FURTHER: That the state and county authorities be urged to cooperate in the location and establishment of such roads as will lead to the ultimate completion of this state system.

RESOLVED: That the state road construction and maintenance fund be supplied from a state ad valorem, inheritance and income taxes, together with an increase in the license fees on motor vehicles, supplemented by state bonds, if necessary, to raise sufficient funds to meet an economic annual expenditure;

RESOLVED FURTHER: That a sufficient amount of this state fund be set aside each year for the adequate maintenance of this state highway system.

WHEREAS, Our present commercial, economic and social needs call for the improvement of trunk line roads which cross and recross state lines, connecting all sections of the country; and

WHEREAS, A comprehensive system, judiciously selected by federal and state authorities, constructed and maintained by and at the expense of the Federal Government would insure a high standard of road building and repair;

THEREFORE, BE IT RESOLVED: That we, the North Carolina Good Roads Association, in annual meeting assembled, favor a national system of highways along the lines set forth in the Townsend Bill; we favor the immediate action by Congress for the enactment of such legislation and that federal aid be increased at the earliest practical time and continued without interference.

BE IT FURTHER RESOLVED: That the Secretary be instructed by the President of this convention to send copies of this resolution to the members of Congress from this state and to the member of the President's Cabinet from North Carolina requesting that they support and work for the enactment of this legislation.

PERSONAL MENTION

James Sproull, of Anniston, Ala., Vice President of the Bankhead National Highway Association and the vice chairman of that association's executive committee, will serve as president of the association until the next annual meeting, to fill the vacancy caused by the death of President T. S. Plowman.

Maj. E. A. Kingsley, whose return from France was noted in these columns on Aug. 13, has resumed his engineering practice at San Antonio, Texas. Maj. Kingsley went to France in September, 1917, and was assigned to road work. In January, 1918, he was put in charge of road construction and maintenance in the intermediate section of the Army's lines of communication. He was at one time city engineer of Little Rock, Ark., and also served as state highway engineer of Arkansas. He entered private practice in 1914.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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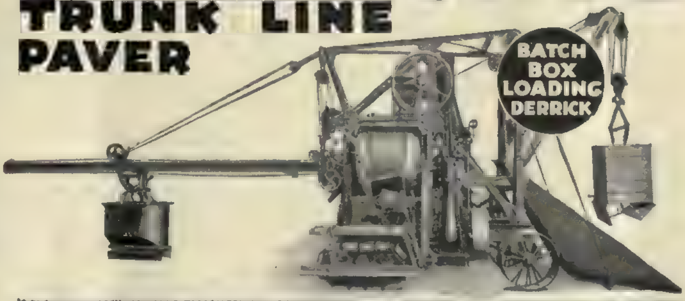

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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVI.
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NEW YORK, SEPTEMBER 10, 1919

Number 11

Cantonment Road Building at Camp Lewis—II*

Methods and Costs of Building About 22 Miles of Gravel Road and Over 150,000 Square Yards of Warrenite-Bithulithic, with Local Gravel Aggregate, on Bituminous Concrete Foundation

By U. S. MARSHALL †

Asphaltic Pavement

Asphalt was selected as the type of pavement of the camp because it could be used the day after it was laid, thereby giving more service to the camp, and also because the gravel to be obtained would have been unsuitable for cement concrete pavement unless a washing plant were installed. For asphalt, the fine silty dust that surrounded every particle of sand and rock when heated and sent through the drums had this fine material removed and made it part of the necessary constituents of asphalt mineral aggregate. Also the hard gravel roads existing in the camp nearly to the correct cross-section of paving were nearly as good a support for asphalt as concrete would be and by using asphalt the value of these gravel roads as a foundation course was obtained. Time has thus far given no cause to regret the selection, for of the 150,000 sq. yd. laid, of which some has had 14 months' wear, there has been not a single failure of the pavement.

GRAVEL ROAD, CALIFORNIA AVE., CAMP LEWIS.

BITULITHIC PAVEMENT ON CALIFORNIA AVE.

Gravel Plant

The gravel plant, located 400 yd. from the asphalt plant, consisted of a three compartment bunker, over the center bunker of which was placed a revolving screen 8 ft. long and 2 ft. 6 in. in diameter. The screen was set at an angle of 15 deg. and was driven at 18 revolutions per minute by a 5 hp. motor. The upper half of the screen was of 1⅜-in. circular holes. This half was surrounded by a concentric screen, 3 ft. in diameter and of ¼-in. circular holes. The lower half of the main screen was of 2½-in. circular holes. Thus the bank run gravel was separated into three sizes: (a) that passing a ¼-in. screen; (b) that passing a 1¼-in. screen and retained on a ¼-in.; and (c) that passing a 2½-in. screen and retained on a 1¼-in. screen.

When the continuous rainy weather came on, it was found that the wet gravel would not pass through the ¼-in. screen at all, so that screen was taken off and was not put on again after the first 10,000 yd. were laid. As the proper separations could be made in the asphalt plants

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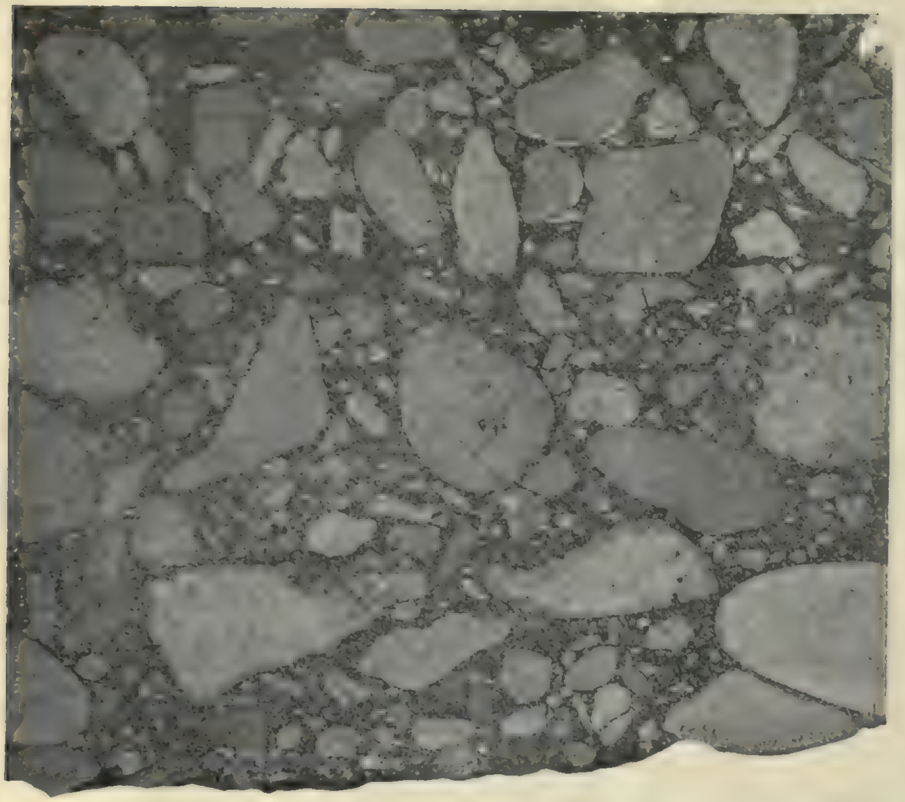
*This article is the complete report by U. S. Marshall, the senior highway engineer who had direct charge of the road construction at Camp Lewis during a period of nearly two years. It should be noted that the costs given are considerably below the normal for the kind of work described and that this is due to the fact that they do not include contractor's profits or overhead expenses; to the unusually favorable conditions; to the abnormally low freight rates, and to the performance of work by Government forces. Suitable sand and gravel were obtained very near the work; asphalt, cement and fuel were brought in at U. S. Land Grant nominal and in some cases free freight rates; the Government furnished teams and drivers and roller men and did part of the subgrading and the senior highway engineer's services were furnished gratis by the Department of Agriculture. A further saving was effected by the patriotic action of Warren Brothers Company in waiving the payment of royalties on the use of its patents.

†Senior Highway Engineer, Bureau of Public Roads, U. S. Department of Agriculture.



SAWED SECTION OF WARRENITE-BITULITHIC PAVEMENT LAID ON CAMP LEWIS ROADS—1½-IN. WEARING SURFACE AND 2½-IN. FOUNDATION—ACTUAL SIZE.

it made no difference. On the other hand, it is believed that a more uniform mixture of gravel was secured without the fine screen. The gravel bunker was supplied at first by a chain elevator, but this method was soon replaced by constructing a wooden chute on a 30 deg. slope running from the ground level of the bunker to a sort of bin at the upper end of the screen. Up this chute a 1 cu. yd. capacity Bagley scraper, drawn by a 25 hp., two-drum donkey engine, with 1¼-in. diameter steel cable, brought the gravel from the pit. The greatest haul was about 300 ft. After this distance was reached the operation became too slow and the direction of the chute was changed. This plant screened 160 cu. yd. of bank gravel in 8 hours, if the drag was within 200 ft.

Another source of gravel for the base layer was by means of a grizzly screen made of ½x2½-in. bar iron, spaced 2½ in. apart by means of pipe washers. This grizzly was 4 ft. long and 5 ft. wide and was mounted in the sloping roof of a sort of shed-like structure under which a truck could be driven. The steam shovel dipper when full would be spotted over screen and opened. The gravel under 2½ in. would pass into the truck and the over-sized would run off the roof and into the pit to be loaded with the return cut of shovel.

This type of screened gravel gave the best base because it was a natural grading of material. The gravel of the camp did not supply enough fine sand for Bitulithic top course. A sand pit was opened on the camp about 2½ mi. from plant, that gave the required kind. Of the 300 lb. of material passing a No. 10 screen required for each 1,000 lb. of mineral aggregate, 60 lb. were supplied from the sand pit.

Asphalt Plants

The asphalt plants were a Warren portable plant for

A WARRENITE-BITULITHIC PAVEMENT AT CAMP LEWIS.

the bituminous concrete base and Warren Bitulithic railroad plants for the wearing surface. The railroad plants weighed 180,000 lb. each. The portable plant weighed about 38,000 lb. These plants had about the same capacity, which was 250,000 lb. of mixture per 8-hour day. The average daily run was 200,000 lb. Minor break-downs of plants, waiting for the larger sized rock in the top plant and poor coal caused the greatest delays. In the portable plant there were no screens. The grading of the mixture was chance only, using bank-run gravel.

Base Material

The following is the grading of mineral aggregate entering into the base course:

No. 4, passing 2½-in. and retained on ½-in. screen, 650 to 450 lb.; Nos. 3 and 2, passing ½-in., retained on No. 10, 200 to 350 lb.; No. 1, passing a No. 10 screen, 150 to 220 lb.

Asphalt used per 1,000 lb. mineral aggregate, maximum 45 lb.; average 40.5 lb.; minimum 38 lb.

Street Operations

With two plants operating, there were two street gangs laying. Laying was continued during the rainy season except when the hardest rains were falling. This was made possible by the solid subgrade. It is impossible to detect any difference between paving laid under various weather conditions. Following is the monthly report of laying:

Month	Rainy Days	Inches of Rain	Square Yards Paving Laid	
November, 1917	16	3.31	9,799	(One plant only)
December, 1917	29	15.31	3,622	(One plant only)
January, 1918	22	4.14	9,499	(One plant only)
February, 1918	20	5.75	12,452	(2d plant in on 15th)
March, 1918	21	3.82	14,078	(2 plants operating)
April, 1918	11	1.13	13,094	
May, 1918	14	1.23	12,185	
June, 1918	6	0.39	19,202	
July, 1918	12	0.75	6,488	(Not opr. 17 to 31st)
August, 1918	13	0.69	(Not opr. this month)	
September, 1918	2	0.45	(Not opr. this month)	
October, 1918	18	4.93	13,408	
November, 1918	22	3.76	16,228	
December, 1918	20	7.29	11,055	
January, 1919	19	9.81	9,979	
February, 1919	Completed work		656	
			151,745	

Screen Tests of Mineral Aggregate

The following is the screen test of mineral aggregate used in Bitulithic top. The average, maximum and minimum are taken from 80 different day's runs.

	Max.	Aver.	Min.
Retained on 1½-in.	0	0	0
Passing 1½-in.	6.5	4.6	1.5
" 1¼-in.	8.5	7.3	3.5
" 1-in.	12.0	10.8	8.5
" ¾-in.	19.0	14.0	9.5
" ½-in.	18.5	17.0	9.0
" ¼-in.	17.0	8.8	6.0
" No. 8 mesh	9.0	2.7	0.5
" " 10 "	7.5	5.1	2.5
" " 20 "	9.5	8.0	6.0
" " 40 "	9.5	7.1	5.5
" " 50 "	8.5	7.5	6.0
" " 80 "	9.0	2.2	0.5
" " 100 "	3.5	3.0	2.0
" " 200 "	3.0	1.9	1.5
		100.0%	

Within the asphalt plant four separations of material were made as follows: No. 4, passing a 1½-in. and retained on a ½-in. screen; No. 3, passing a ½-in. and retained on a ¼-in. screen; No. 2, passing a ¼-in. and retained on a No. 10 screen; No. 1, passing a No. 10 screen.

The average weight of each size was as follows: No. 4, 340 lb.; No. 3, 210 lb.; No. 2, 150 lb.; No. 1, 300 lb. Asphalt used per 1,000 lb. of mineral aggregate; average for entire job, 73 lb.; maximum, 74 lb.; minimum, 70 lb.

Cost of Pavement

BITULITHIC PAVEMENT IN FRONT OF RED CROSS BUILDING AT CAMP LEWIS.

The average cost per square yard for the entire job was higher than it would have been under the ordinary construction conditions, for the following reasons: When paving was begun, the order called for 40,000 sq. yd. Asphalt for this work was contracted for $12 per ton, f. o. b. California refinery. When the second order came for paving, the contract price for asphalt was $15.50 per ton for asphaltic cement, and $16.50 per ton for Bitulithic cement. The second order was for 50,000 sq. yd. The third order for paving was for 40,500 sq. yd. and the cost of asphalt was $17.00 for asphaltic cement and $18.00 per ton for Bitulithic cement. The fifth order for pavement was for Greene Park, and amounted to 22,133 sq. yd. Asphalt for this job cost the same as for Job No. 4.

Had it been known that all the work was to be done, $5,000 could have been saved on asphalt. Also, between jobs No. 3 and No. 4 a period of 70 days intervened, during which no asphalt was laid. This was during July, August and September, the best months of the year for asphalt work.

Summary of Paving Costs—Camp Lewis & Greene Park

The following are cost data for paving during the entire period:

Operating asphalt plants	$0.332	
Rentals of asphalt plant	0.081	
		$0.4130
Furnishing sand and gravel and asphalt, operating bunkers and hauling to plant		0.3350
Street Operations:		
Hauling mixed product and laying asphalt surface		0.2770
Earth Work:		
Shoulders	$0.1550	
Subgrade	0.2019	
Side strips	0.0264	
		0.3833
General Expense:		
Rental of autos	$0.0213	
Fuel and oil for autos	0.0025	
Office supplies	0.0070	
Industrial insurance and medical aid	0.0179	
Undistributed purchases	0.0038	
		0.0525
		$1.4608
Grand total cost, exclusive of contractor's percentage profit		$1.4710
Total yards paving laid—Camp Lewis		129,612
" " " " —Greene Park		22,133
" " " " —Camp Lewis and Greene Park		151,745

When Field Auditor received report of check from ware-

LAYING BITULITHIC PAVEMENT IN THE RAIN AT CAMP LEWIS, AMERICAN LAKE, WASHINGTON.

STANDARD PORTABLE WARREN MIXING PLANT USED IN PREPARATION OF FOUNDATION.

WARREN RAILROAD PLANT USED FOR THE PREPARATION OF WARRENITE-BITULITHIC SURFACING.

house and approval of price and discount from price clerk he authorized contractor to make payment of bill, the seller receipting two invoices, returning same to contractor, who in turn sent one of the receipted invoices with original requisition to Field Auditor, who in turn authorized Government payment of amount to contractor and check was drawn by Constructing Quartermaster.

WORK OTHER THAN PAVING PERFORMED BY ROAD CONTRACTOR.

Item.	Quantity.	Unit Cost.	Total Amount.
Gravel and graded roads......	120,000 cu. yd.	$0.57	$68,600.00
Grade warehouse ground......	28,000 "	0.29	8,100.00
Grade building sites and grds.	41,000 "	0.43	17,700.00
Grade for R. R. tracks........	4,500 "	0.30	1,340.00
Oil temporary roads..........	63,600 sq."	0.05	3,180.00
Sprinkle roads................	24 mi.	142.00	3,400.00
Maintain roads during constr'n	24 mi.	182.00	4,350.00
Drainage including remount..	24,000 cu. yd.	0.68	16,505.20
Total for above items..........................			$123,175.20
Expended for machinery, etc., now Government property and worth now........................			6,500.00
Total expended exclusive of pavement............			$129,675.20
" " for asphalt pavement with camp...			189,706.78
" " for pavement in Greene Park......			32,557.64
Total			$351,939.52
Add contractor's profit of 6½% of above..........			22,876.07
Grand total....................................			$274,815.59

Conclusion.

The contract for road work was awarded to the Independent Asphalt Paving Co., F. T. Sherman, President. The company was represented during the first month of the work by R. A. Dirkes, who, in turn, was superseded by D. A. Williams, who remained until asphalting started, when Mr. O. A. Mackintosh became superintendent of the work and remained until completion.

It gives the writer great pleasure to record the fine cooperation that existed in all transactions with the company and these gentlemen.

To the Warren Brothers Company who generously furnished without cost to the Government their patent right for Bitulithic pavement and who also transferred to the contractor's force a plant chemist who was present during all the operations of the plants, thanks for a patriotic service are due.

◆

The Indiana State Highway Commission has received an additional allotment of 231 motor trucks from the Federal Government. This brings the total number received by the commission to 597, it is stated.

County Bond Elections in Texas have recently been carried as follows: Cherokee County, Road District No. 2, $350,000; Red River, District No. 14, $75,000; Road District No. 15, $25,000; Anderson, Neches District, $75,000; Tarrant, $3,450,000; Nueces, $2,000,000; Live Oak, $60,000; Gonzales, $104,000.

VIEW OF PART OF CAMP LEWIS—TAKEN FROM THE FLAG POLE.

Highway Maintenance in Wisconsin—V[*]

The Upkeep of Surfaced Roads Continued—Surface Treated and Untreated Macadam—Bituminous Macadam Roads—Cold Patching Methods—Concrete Roads—Bridges—Markers and Signs.

Surface-Treated Macadam Roads

Time of Treatment.—With the rapidly increasing motor traffic on our main thoroughfares, it is useless to continue building stone macadam roads unless we plan for their maintenance by a surface treatment with some good asphaltic oil or refined tar.

The surface treatment must be applied just as soon as the road surface has become cured or set to a point where sweeping with a power sweeper will remove all dust and vegetable matter without disturbing the wearing surface. If a road has been properly built and frequent showers occur following its opening to traffic, it will be in condition to oil within a month after completion. It is frequently advisable to apply the surface treatment before a new road is opened to traffic. In this case traffic must be kept off the road for at least 48 hours after treatment.

Application.—Where surface treatment is required, it will be done at least once a year, as early in the season as possible, by the county oiling gang, permitting the patrolman to maintain his section properly from the beginning of the season. The patrolman must travel over all surface treated roads in his section each day for at least one week after they have been opened to traffic. He must have with him a small supply of the bitumen used in the surface treatment, a pouring pot and some torpedo sand, stone chips or pea gravel. Places on the surface where the bitumen failed to penetrate will show up within two to four days and the patrolman must apply the required amount of bitumen immediately, being sure to get proper penetration. He must then cover the newly applied bitumen with torpedo sand, stone chips or pea gravel, in the same manner as when first treated. Should certain places show an excessive amount of bitumen, he should apply absorbent, a little at a time, until the surface stops bleeding. Pea gravel is very good for this purpose.

Cold Patch Method

Patching.—Specially prepared bituminous materials have been used for several years for patching holes in macadam roads by what is termed the "cold patch method." The common practice is to mix the bitumen with crushed stone and sand on a board platform as concrete is mixed by hand. The "patching material" is made by thoroughly mixing stone that will pass through a 1-in. ring and be retained on a ¼-in. ring, with from 15 to 20% of clean, sharp sand and 16 to 20 gal. of bitumen per cubic yard. The exact amount of bitumen required will depend somewhat upon the size of the stone and upon weather conditions. Care must be exercised, as a too rich mixture will have a tendency to rut and heave or crowd out of the hole.

The material may be used immediately after mixing, but better results are obtained if it is allowed to season for from three to six days before using. It will then tamp into the holes and pack much better and harden more quickly.

The patrolman should keep a supply of "patching material" mixed in advance, where needed. The work may be done in a shed or barn on rainy days when other work can not be done, and the material hauled to the road as needed. It is well to mix a supply of "patching material," using stone that will pass through a ⅝-in. ring to fill the smaller holes as they may appear on the surface.

The holes must be thoroughly cleaned, all loose stone removed and the surfaces of the holes well painted with bitumen before the "patching material" is used. The edges of the holes should be as nearly vertical as possible, or better, have the bottom of the hole larger than the top. If the hole is of considerable depth, the lower portion should be filled with crushed stone from 1 to 2 in. in size, well tamped into place and covered with a light application of bitumen. The hole is then filled with the "patching material" and well tamped in. If necessary, after two to four days the patch should receive a light seal coat of bitumen and a covering of torpedo sand or fine stone chips, be again tamped and then opened to traffic.

With Light Oil or Tar.—Where the patrolman has not been provided with specially prepared bitumen for patching holes, very satisfactory work may be done by using a light asphaltic oil or refined tar. The hole is cleaned out thoroughly first, the surface of the hole then saturated with bitumen and filled with stone, using as large stone as the depth of the hole will permit. The stone must be well compacted in the hole and just enough bitumen applied to cover the outer surface of all the stone placed. Cover the stone with chips from ¼ to ½ in. in size and tamp thoroughly with a hand tamper. In all cases care must be taken to insure the finished patch being just flush with the adjoining surface. A straight-edge is found to be very useful in determining the actual depth of new material necessary.

The patrolman in charge of a surface treated section must keep everlastingly after the holes that appear on the surface and keep the culverts and shoulders in the best of condition. If at any time he can see nothing urgent to do, he may well spend his time hauling new material and depositing it along the roadside where it will be convenient for use when needed. He can also find plenty to do in widening the shoulders at narrow places.

If the above methods are followed, a stone macadam road can be maintained in excellent condition for travel almost indefinitely, but this can be done only at the price of eternal vigilance on the part of the patrolman.

Untreated Stone Macadam Roads

Worn Macadams.—Many of the older stone macadam roads which have received no surface treatment are so badly worn that surface treatment at this stage is not advisable. In these cases the surface is maintained in about the same manner as advised for pit run gravel roads. In many instances the finer stone has been thrown out to the edges of the traveled way and is moved in with the road grader to assist in filling holes and ruts on the old surface.

The work is done early in the spring while the surface is moist and somewhat disintegrated from the frost action. This is also the proper time to add new material, and the material should be available along the roadside within easy reach of the patrolman. If crushed stone or gravel is used, it should contain the material passing through a ring not larger than ¾ in. in diameter, and including all the finer material. The best material to use would be pea gravel

(Continued on page 136)

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[*] From "Highway Maintenance," Bulletin No. 8, Wisconsin Highway Commission, a publication devoted especially to patrol maintenance on the state highway system, compiled by J. T. Donaghey, Maintenance Engineer.

Good Roads*

The Advantages of Good Roads—Their Cost Less Than That of Bad Roads—Money Spent for Roads Kept at Home—Value of Farms Increased by Good Roads—Should Employ Engineers

By RODMAN WILEY†

Some wise man has ably said: "Roads rule the world—not kings nor congresses; not courts nor constables; not ships nor soldiers. The road is the only royal line in a democracy, the only legislature that never changes; the only court that never sleeps; the only army that never quits; the first aid to the redemption of any nation; the exodus from stagnation in any society; the call from savagery in any tribe; the herald of prosperity. The road is umpire in every war, and when the new map is made, it simply pushes on its great campaign of help, hope, brotherhood, efficiency and peace."

Keep the Boys and Girls at Home

It is impossible to keep the boys and girls at home on a farm when the farm is located several miles from town on an impassable road. To be compelled to live on a bad road is worse than being confined in jail. Those of you who had sons in the Army should not forget that those boys had the opportunity of seeing good roads at many points in this country and in France and England. They know that good roads saved Paris and, indirectly, perhaps, saved America from the Prussian heel; and they are now thoroughly convinced that good roads are not only desirable, but necessary. And I say to you in all sincerity that they will not be contented to live as they formerly lived.

Build good roads to the towns. You will lose none of the goodness and purity of the country, the sunshine and the air; the scent of the new-mown hay and the silent benediction of the evening will still be yours, but with good roads and a suitable conveyance, your children will be contented to stay at home on the farm where they belong.

Bad Road Tax Is More Than Good Road Tax

It is no longer a question of not being able to afford good roads, because, from a plain business standpoint, you cannot afford to be without good roads. The tax for bad roads is many time more than the tax would be for good roads. Consider the country store located ten miles from a railroad station on a bad road. On every article that is purchased at the store there is a bad road tax—whether it be a plow, a hoe, a pair of overalls or a dress—not because the country merchant is making any more profit than the town merchant but because the country merchant has to pay an enormous price for hauling his goods from the railroad station to the store and that cost must be added to the selling price in order for him to make the same profit that is made by the town merchant.

The question of not having the money to build roads is one that we have framed in our minds, it is not really true. A county will always be poor, financially speaking, if it continues to have bad roads. As a plain business proposition, any man could well afford to take options on the property on both sides of the highway and build that road of good materials at his own expense, because when completed the increase in the property values alone would more than pay for the cost of the road and at the same time leave to him a good profit, but under the state aid plan in this state, the counties pay only from 25 to 50% of the cost of an inter-county seat or federal aid road.

Suppose a road is to cost $20,000 per mile, and that the county's share of the cost is 25% or $5,000. There are 640 acres to the square mile and for both sides of the road that would be 1,280 acres, and if you consider that the country is not benefited for any greater distance than a mile from the road and that the property owners are to pay all of the county's part of the cost, that would mean that they would only have to pay about $4.00 per acre. Any sensible man knows that good roads will benefit a farm a great deal more than $4.00 per acre. Besides the country is benefited for a much greater distance than 1 mi. from the road. Why is it that a man will confront such figures and yet not be willing to build good roads? It is one of the best investments in the world. No government, no state, no county, and no individual that has ever built roads is willing to sell the roads for what they cost, which is to my mind sufficient proof that roads are an excellent investment. That one fact alone should be the cause for building good roads throughout the length and breadth of every county in the State of Kentucky.

Before the farmer would lay aside the cradle and use the modern reaper; before bankers and other business concerns would purchase adding machines; before all business houses would have telephones installed, it was necessary to have a campaign of advertising and education. If such things are desirable, figure what was lost by doing without them, so why cannot we skip the agitation, the educational campaign and build roads now instead of waiting a number of years and losing money by having bad roads?

Senator A. O. Stanley, in one of his able addresses on good roads, said, "Good roads, better roads, and more of them should be a plank in every political platform; a doctrine of every church; included in the pharmacopoeia of every physician; written into the curriculum of every college and university and the by-laws of every corporation."

Every County Went Over the Top

Every county in this state went "over the top" in every Liberty Loan drive, every Y. M. C. A. drive and every Red Cross drive. Why cannot you now go "over the top" for good roads? Most of the money that you have furnished for such purposes as I have mentioned has gone out of the county entirely, but when you build roads practically 75% of the money expended is left in the county and is used in hiring men and teams. In addition you get the roads.

Greater Part of Money Left in County

If a county should build an earth, gravel or macadam road costing $200,000 and it happened to be of such an assessed valuation that it only paid 25% of the cost, the county's part would be $50,000 and in building the road there would be left in the county at least $150,000 or three times as much as the county furnished. You can easily verify what I have said by going to the records in your own county where state aid work has been done. You will find that practically all the money has been paid out in hiring men and teams and about the only money that leaves the county is that which goes to purchase a few feet of culvert pipe, perhaps a steel bridge or some reinforcing steel.

Roads Will Connect all Sections of State

Good roads will link up every section of our state. It is now possible to have a coal famine in towns not 50 mi. distant from the richest coal fields in the world, in eastern and western Kentucky. It is impossible at this time for

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*Address delivered at Williamsburgh, Ky., July 14, 1919.

†Commissioner of Public Roads of Kentucky.

Kentuckians to either think or read about the same thing at the same time. In eastern Kentucky they read Cincinnati papers; in western Kentucky they read Tennessee, Indiana and St. Louis papers. The people in eastern and western Kentucky cannot be as much interested in what the people are doing in Tennessee and Indiana as they are in what they are doing in Kentucky. We naturally are a sociable people and are interested in knowing what is being done in our own state.

Sentiment in Road Building

There is some sentiment in the building of roads. This war has taught us that we should be neighborly. We no longer look upon one of the Allies as being separated from us by a great body of water, but we feel that we can reach across and shake their hands. It may not be possible for every man in any one county to get a road immediately, but he certainly should not try to keep his neighbor from having a road, and it should be remembered that some one road must be the first road built. If you cannot get your road this year, help some other man get his, and when that road is built you have a much better chance of getting the next one.

Some one has said that, "Men are valuable just in proportion as they are able and willing to work in harmony with other men. When a person loses his ability to cooperate with others he has joined the 'down and out club,'" and Walter Foss emphasized the friendly, neighborly side of man, when he said:

"Let me live in my house by the side of the road
  Where the race of men go by
There are men who are good; there are men who are bad,
  As good and as bad as I.
Then why should I sit in the scorner's seat,
  Or hurl the cynic's ban?
Let me live in my house by the side of the road
  And be a friend to man."

Not long ago I sat in court and heard a jury declare a woman insane, principally because of isolation; and the county judge told me that within the past two years several persons had been sent to the asylum from his county for the same cause. If you go to the death chamber when a father and mother have lost their only child, you will find no sadder scene than you will find in the humble home located ten miles from a town on an impassable road, where it is practically impossible to have the services of a doctor.

Some Men Don't Want Roads Because Land Will Increase in Value

Some men say that they do not want good roads, because roads will not increase the productiveness of the soil but will increase the price of the land, compelling them to pay more taxes. Such a man is not honest with himself. If a man does not want his farm to increase in value why does he improve that farm by building a good house or a good barn or by rotating his crops to make his land produce more corn and more wheat? Every man wants his farm to increase in value. If a farm located on a bad road is worth $10,000 why would it not be a good investment for any man to help build a road and make the farm worth $20,000? That man would leave to his children 100% more money because the road was built.

False Reports

One thing which retards the road movement is the circulation of false reports concerning the cost of the roads. Some men without any knowledge of the subject make the bold assertion that roads cost too much money. Such an assertion means nothing, carries with it no constructive idea, might be totally devoid of the truth and certainly is dangerous propaganda when uttered by any but those well informed. Such an expression is just as meaningless as it would be to say that a bronze statue cost too much, without taking into consideration the size, installation or character of the work; or that a house cost too much without knowing the number of rooms, the amount of plumbing, kind of finishing, etc.; or that a horse cost too much without knowing whether or not the animal was Dan Patch, Lou Dillon or a common horse seen on jockey ground.

The cost of any road is made up of several items, and the cost of each consecutive mile of any road may vary greatly, depending altogether on what work has to be done on that mile. On the first mile, it may be necessary to move 10,000 cu. yd. of earth, while the next mile may not require 1,000; on the first mile, it may be necessary to install several culverts, to build a few bridges; and on the next mile, perhaps, no drainage structures are necessary. If the road is to be surfaced with stone or gravel, the length of haul will influence the cost of the surfacing on each mile, and certainly such cost will vary unless the length of the haul is exactly the same and unless water is available alike on each mile.

Before making any statement as to the cost of any road, an investigation should be made to find out what is to be done on that road. Add every item which enters into the cost, and then one can talk intelligently. If that practice is followed, it is easy to see that the only way the cost can be reduced is by eliminating some of the elements that make up the cost.

In this connection, I have observed that there have never been too many culverts built on a road; I have never known bridges to be built larger than is necessary to carry the water; have never seen too much ditching done or the shoulders too well built; and it is seldom indeed that too much metal is used in building new roads. Oftentimes our roads are built entirely too narrow. The cost of building roads has increased, and likewise now the cost of practically everything is more than it was a few years ago.

If roads cost, say, $2,000 per mile when tobacco was selling for 5 ct. per pound, people who make their money by raising tobacco can afford at this time to pay ten times the former cost, or $20,000 per mile for the same road, because tobacco is selling for 50 ct. per pound today. Many more such illustrations could be given. We should not forget that when comparing the cost of things today with what they cost 15 or 20 years ago, we should compare the selling price of our products then and now.

Engineers in Road Work

I desire to touch only on one more point and that is the place of engineers in road work. Some men, even county officials, have made the bold assertion that they do not want engineers to handle the road work, because they are not practical. Certainly no one wants to employ an impractical man for anything, whether he is a druggist, a lawyer or a farmhand, and some would-be engineers are impractical, but the same is true of doctors, lawyers and mechanics. Some of the counties in this state have been spending money on roads for 75 years and yet today there isn't a quarter of a mile of good road in the county. That convinces me that the system has been wrong and certainly was handled by impractical men, but not engineers. Every feature of road work is an engineering problem, and practically everything not made by nature that is of use to man is the work of an engineer. To say that engineers are impractical is untrue in the first place. Engineers design, construct and maintain our railroads, our canals, harbors, street railway lines, telephone and telegraph lines, electric lighting systems, sewer systems, battleships, locomotives, automobiles and many other things, and how has it been possible to accomplish so much with impractical men in charge?

If you would have your roads properly constructed and maintained you must furnish the necessary funds and secure the services of a competent highway engineer. Any other plan will prove a failure. If you doubt what I say investigate for yourselves, because it is foolish to make mistakes after investigation.

Let us resolve to have good roads in every county in dear old Kentucky and that they will be built not eventually, but now.

Examination for County Engineers in Oklahoma

Subjects, Weights and Questions in an Examination Held in May of This Year

The road law of Oklahoma provides that the board of commissioners of each county shall employ a county engineer who shall have "a practical knowledge of civil engineering and be skilled in bridge, culvert and road building." It is further provided that he must possess a certificate of competency from the State Highway Department and the State Highway Commissioner is authorized to appoint three disinterested civil engineers to act as a board of examiners. In an examination given on May 26 and 27 of this year, the various subjects included were weighted as follows: Application blank, 15; roads and drainage, 20; bridges, 10; contracts and road law, 10; surveying, 12; mathematics, 11; concrete, 12; oral examination, 10.

Lists of questions included in all but the oral examination are printed in the subjoined paragraphs, the information being taken from the 1919 "Transaction" of the Oklahoma Society of Engineers.

Roads and Drainage.

(Weights: Total 20; per Question 2½)

I. What crown would you give: (a) Sand-clay road 30 ft. from shoulder; (b) loam; (c) sand; (d) clay; (e) gravel; (f) bituminous bound macadam; (g) concrete.

II. Draw cross-section of an earth embankment road with 24-ft. crown, with a fill of 6 ft. to the left and 3 ft. to the right, located within the confines of a 50-ft. right of way; (a) show proper slopes for sand fill, (b) good loam fill.

III. Draw cross-section of a side-hill cut with a crown width of 30 ft., where the average slope is 3 ft. in 10, with a cut on the uphill side of 10 ft.; (a) earth, (b) solid rock.

IV. How do you proportion the size of an opening to the drainage area? Explain fully.

V. You are constructing a road on a side-hill whose soil erodes badly; state principal provision you would adopt to check erosion of the road and its slopes.

VI. If 3 in. of rain were to fall on one acre of ground, what would be the number of gallons, and how long would it take a 24-in. pipe with a fall of 1 in. to the foot to carry away the water, assuming a 20% run-off?

VII. A contract is let to clay a mile of road 30 ft. wide, 16 in. deep. The clay pit is 50 yd. to one side of the road, and 3,000 ft. from one end. Assuming 300 ft. free haul, and 2 ct. per yd. additional for each 100 ft., base price being 30 ct. per cu. yd., what should this job cost? Show figures. In practice would you base your yardage on borrow pit measurement, dump or wagon? Why?

VIII. What would you estimate the cost of a 100-ft. section of concrete pavement, of a 1:2:3 mix, 18 ft. wide, 8½ in. thick at the center, 6¼ in. thick at the sides, where the average haul of material is 2½ mi., and the prices of material at loading point are: Cement, $2.35 per barrel, net; crushed stone $2.25 per cu. yd.; sand, $1.50 per cu. yd.; labor is 40 ct. per hour, teams, 75 ct. per hour; assuming 15% for general overhead expenses and 10% for net margin of profit? Show figures and outline of estimate.

Bridges

(Weights: Total 10; per Question 2)

I. Define: (a) Stress; (b) strain; (c) fatigue of material; (d) modulus of elasticity; (e) deformation; (f) tension; (g) compression; (h) bending; (i) shear; (j) elasti limit; (k) ultimate strength; (l) yield point; (m) factor of safety; (n) safe working stress; (o) secondary stress; (p) live load; (q) dead load; (r) impact; (s) wind load; (t) tensile strength; (u) strut; (v) tie; (w) top chord; (x) girder; (y) beam; (z) truss.

II. State briefly requirements under Oklahoma loading law for long and short span steel bridges.

III. Is piled or spread footing preferable for abutments for 50-ft. span? Give conditions under which you would choose each, and sketch plan of each for gravity type of abutment.

IV. What would be the safe, uniformly distributed load on an 18-in. standard I-beam, 30 ft. long, supported at both ends.

V. (a) What slab thickness would you recommend for a concrete slab, width 16 ft. clear span, to conform to Oklahoma loading requirements? (b) What is the relation of area of steel to area of concrete in the slab thickness you would recommend? (c) State briefly reasons for using reinforcing steel in the design of concrete structures.

Contracts and Road Law

(Weights: Total 10; per Question 2)

I. (a) What bonds are required by law for road contracts and what are their purposes? (b) What is absolutely necessary in order to make a contract a valid obligation and what is the most important part of a contract from an engineering standpoint?

II. State legal requirements with regard to advertising for bids for road and bridge work. Give exceptions, if any. Full discussion required.

III. (a) What funds are made available by direct taxation to pay for highway improvements? State the limitations in the use of each. (b) How is maintenance fund derived? From what sources, and for what purposes may it be expended?

IV. (a) Give briefly the more important duties and responsibilities of the Commissioner of Highways. (b) Give briefly power and authority of the State Engineer. (c) Give briefly duties and responsibilities of the County Engineer.

V. (a) Describe in order the steps to be taken by County Engineer and Board of County Commissioners prior to starting the actual construction of a state road. (b) What are the legal restrictions governing the designation of state roads; and what are the steps necessary in such designations?

Surveying

(Weights: Total 12; per Question 2)

I Explain how to make two ordinary adjustments of (a) transit, (b) wye level. (c) In what particular use of the instrument would the lack of adjustments given cause an error?

II. (a) Write out an imaginary set of level notes, beginning at Station 0+00, at assumed bench mark, elevation 500 ft., and running to Station 30+00 and closing on a bench mark, elevation 575 ft., placing two intermediate bench marks properly referenced for construction use. (b) What would you consider an allowable error for this distance?

III. (a) Write out a set of imaginary transit notes, beginning at Station 0+00, and running to Station 15+00, where two tangents intersect at an angle of 20 deg. 45 min. (b) Show station plus of point of 4 degree curve, and station plus of its point of tangent. (c) Show length of middle ordinate and external of said curve. (d) Show chord length and radius of said curve.

IV. Write briefly how you would proceed to properly survey the exterior boundary lines of the N. W. quarter of an interior section of land.

V. Make a sketch showing all stakes you would set in laying out a bridge with two similar abutments with wing walls at 22½ deg. from parallelism with centerline of road. Number in order of setting and describe procedure.

VI. A 3% positive grade meets a 4% negative grade at Station 10+00 and elevation 50. Sketch in 400-ft. vertical curve showing true elevations at each 50 ft. along said curve.

Concrete

(Weights: Total 12; per Question 2)

I. (a) How many sacks of cement to the yard in 1:2:4 mix concrete? (b) How many yards of stone that will pass a 2-in. ring? (c) How many yards of sand?

II. What mix concrete would you use in (a) footing, (b) abutments or walls, (c) beams, (d) slabs.

III. In perfectly mixed concrete, what is the function of sand; of the cement; and how do these affect the proportion of the aggregates to be used?

IV. (a) What is your criterion to secure the proper amount of water in concrete? (b) To secure thorough mix?

V. Assuming that the concrete has been properly mixed, what requirements must the forms have to insure good work?

VI. (a) Define initial and final set. Which is the most important to you and why? (b) What is regaging? Is it advisable? Give reasons.

Mathematics

(Weights: Total 11; per Question 1)

I. The side of an equilaterial triangle is 296 ft. Find area.

(Concluded on page 137)

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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MORE ANENT THE TOWNSEND BILL

That the Townsend Bill, if enacted into law, would not militate against the workings of the present federal aid law is made clear by Senator Townsend in a statement printed elsewhere in this issue. The statement, it is explained, was made in reply to objection to the measure made by those who feared that its operation would tend to make less effective the work to be done under the Federal Aid Road Act of 1916 and the amendments thereto.

As explained by Senator Townsend, his bill provides for the construction of a system of roads entirely separate from those to be built under federal aid—for federal roads, not federal aid roads. These are to comprise a "national highway system;" are to be selected by a "federal highway commission" of three members, and are to be built and maintained under the commission's direction at the expense of the National Government.

The Townsend Bill does provide that the powers and duties of the Secretary of Agriculture in respect to the administration of the present federal aid laws shall be transferred to the federal highway commission. It also specifically provides that "the appropriations now available to the Secretary of Agriculture for such highway purposes shall continue in force and effect under the control of the commission in the same manner as they were in force and effect under the control of the Secretary of Agriculture prior to the passage of this act."

In other words, the Townsend Bill in no way interferes with the carrying out of the provisions of the existing federal aid laws and interposes no material obstacle to the continuation of road improvement by the states with federal aid; it merely proposes a change in the organization in charge of such work. It may be that it would have the effect of lessening the efforts of the states, but it does not seem likely.

The Townsend Bill has the backing of many powerful interests, and it has encountered some strong opposition. It offers one method securing a system of national highways, something that is generally regarded as not only desirable but necessary. The present federal aid plan does not provide for a connected national system, but for something entirely different. There seems to be no good reason for the fear that the Townsend plan would interfere with the successful operation of the federal aid plan.

THE COMPENSATION OF ENGINEERS IN PUBLIC WORK

Dr. F. H. Newell, of the University of Illinois, who is the president of the American Association of Engineers, is credited with the statement that there is a scarcity of experienced men in the highway engineering field and that for this reason much money is being wasted.

Even a cursory examination of the items under the heading "Personal Mention" in engineering periodicals will show that many experienced engineers are leaving state and county highway departments to take positions with private business concerns.

These conditions have a very deep significance and are due to one cause—the inadquacy of the remuneration of highway engineers in public service. This is a matter to which frequent reference has been made here in the past, and to which attention will often be directed in the future, for until it is remedied the waste of the taxpayers' money will go on and good engineers will continue to leave public work for lines in which they can sell their services for pay more nearly commensurate with their worth.

While the scarcity of experienced men in the field of highway engineering undoubtedly exists, it is not due to any lack of able men. It is caused by the lack of inducements to enter that particular field. The graduate from an engineering course is not a road builder or a specialist in any other line; he is not even an engineer. In the nature of things he can not be, for the fundamentals of an engineering education are so many and so broad that the best four-year course yet devised can do no more than lay the foundation upon which to build. These young men, however, can and do go out into the various fields open to them and, because they are well grounded in the rudiments of their calling, they soon acquire the experience and training that make them competent in the work they choose.

No well informed and unbiased observer can deny that engineering in all its branches is a grossly underpaid calling. Nor can there be much doubt that in public service—in highway work or in other branches—the average pay is lower than the average in private organizations.

Under these conditions, there is seldom much to attract the experienced engineer to the highway field, nor is the young engineer just starting upon his career likely to choose that branch if he understands the situation. And those young men who for one reason or another do take up road work in the service of states and counties. and who make good, sooner or later are apt to find better opportunities elsewhere.

This is quite as bad for the public as for the engineers. A man's worth in any job is largely dependent upon his experience in the kind of work he is doing; if he is a man of ability and dependability, it is chiefly his experience that determines his worth. Since there is little opportunity except in the service of a state or county highway department for an engineer to gain the experience that will qualify him for such work, it should be obvious that it is in the public interest as well as in the interests of engineers to pay sufficient salaries to attract good men and to keep them after they have become expert.

Oregon Engineering Examiners

Board to Examine and License Engineers Organized in Accordance with Recent Law

In accordance with the law providing for the licensing of engineers in Oregon, note of which was made in "Good Roads" for March 15, the Governor has appointed the members of the board, and the board has organized by the election of officers. While the act became effective July 1, professional engineers already practising in the state were allowed until Jan. 1, 1920, to register.

The Board of Engineering Examiners consists of: F. S. Baillie, of Baker, mining engineer; R. R. Bartlett, of Astoria, civil engineer; G. A Covell, of Corvallis, mechanical engineer; W. B. Dennis, of Carlton, mining engineer; F. Hesse, of Portland, mechanical engineer; E. G. Hopson, of Portland, hydraulic engineer; O. Laurgaard, of Portland, civil engineer; J. H. Lewis, of Vale, hydraulic engineer; F. D. Weber, of Portland, electrical engineer.

Several meetings have been held and by-laws, rules and regulations have been adopted. Officers for the two years ending July 1, 1921, have been elected, as follows: President, O. Laurgaard, City Engineer of Portland; Vice President, F. D. Weber, electrical engineer for the Oregon Insurance and Rating Bureau; Secretary, A. B. Carter, civil and mining engineer.

The board has established headquarters at the Corbett Building, Portland.

It has been announced that the business of the board will be transacted largely by three committees which have been appointed, as follows: Executive Committee: O. Laurgaard, E. G. Hopson, G. A. Covell; Finance Committee: F. D. Weber, chairman; W. B. Dennis, R. R. Bartlett; By-Laws and Rules Committee: F. Hesse, chairman; F. S. Baillie, John H. Lewis.

Motor Vehicles in Massachusetts

Registration for First Eight Months of 1919 Greater than for the Twelve Months of 1918—Future Control and Revenues

During the eight months of 1919, the Automobile Department of the Massachusetts Highway Commission has given out 164,000 plates for passenger cars and 38,000 plates for motor trucks. The number of passenger car plates exceeds by 22,000 the number of plates given out during the entire year of 1918, while the number of truck plates is greater by 5,000 than the number issued last year. The total receipts for the eight months amount to $2,400,000, which is $250,000 in excess of the total receipts for 1918.

While the present year has been an exceedingly busy one, the indications are that 1920 will be even busier. The Commission is making every effort to mail to all who registered cars in 1919 the necessary blanks for the 1920 registration, and it is expected that these will have been sent out by the middle of October. The plates for 1920 are being made at the state prison at Charlestown, as was noted in a previous issue of "Good Roads," and many of them have already been received and stored at the State House. The Commission expects to begin selling the plates, over the counter and by registered mail, on or before Nov. 1.

The Highway Commission has had control of the Automobile Department since the first laws relating to automobiles were passed about fifteen years ago. On Dec. 1, however, the new law, noted in the issue of Aug. 20, will go into effect, and the work hitherto carried out under the direction of State Highway Commissioner James W. Synan will devolve upon a registrar of motor vehicles, who will be appointed by the commissioner of the new Department of Public Works which will take over the duties of the Highway Commission.

It is expected that the changes in truck fees, which go into effect on Oct. 9, will so increase the revenues from motor vehicle registration that at least $3,000,000 will be obtained in 1920. The receipts for this year will probably amount to $2,650,000, and all of this money will be available for road work.

Truck Distribution Stopped

Transfer of Motor-Driven Vehicles From the War Department to the Department of Agriculture for Distribution to States Held Up by the Judge Advocate General

The distribution of motor trucks to the various state highway departments for use in federal aid road work has been held up by a recent decision of the Judge Advocate General of the Army.

This distribution has been made under Section 7 of the Post Office Appropriation Bill of 1919, which is as follows:

> Section 7. That the Secretary of War be, and he is hereby, authorized in his discretion to transfer to the Secretary of Agriculture all available war material, equipment, and supplies not needed for the purposes of the War Department, but suitable for use in the improvement of highways, and that the same be distributed among the highway departments of the several states to be used on road constructed in whole or in part by federal aid, such distribution to be made upon a value basis of distribution the same as provided by the Federal Aid Road Act, approved July 11, 1916: Provided, that the Secretary of Agriculture, at his discretion, may reserve from such distribution not to exceed 10 per centum of such material, equipment, and supplies for use in the construction of national forest roads or other roads constructed under his direct supervision.

According to a letter from the director of sales of the Purchase, Storage and Traffic Division of the War Department to the Bureau of Public Roads, the Judge Advocate General of the Army has rendered an interpretation of Section 5 of the Sundry Civil Bill to the effect that since Section 7 of the Post Office Appropriation Act "does not specifically authorize the transfer of motor propelled vehicles and motor equipment, that this statute is repealed and no further transfers should be made." This decision has been approved by the Secretary of War and orders have been issued that no more motor vehicles be transferred until Congress specifically authorizes further transfer of motor equipment.

Highway Maintenance in Wisconsin—V

(Continued from page 131)

not exceeding ¾ in. in size, possessing good bonding properties. This material, where available, is cheaper than stone, binds more readily and gives a smoother and more satisfactory surface. Where no material is available, a badly worn macadam surface may be greatly improved by a light application of sharp sand or a sand and clay mixture with sand predominating.

Cover the worn surface with from 1 to 2 in. of sand. Level it up with the light grader and use the planer frequently. If the travel throws the sand out towards the shoulders, move it back toward the center with the grader. This type of maintenance is reasonable in cost and very satisfactory.

By following the above methods an old macadam road may be maintained in reasonably good condition for travel by the patrolman until funds are made available for its reconstruction.

Bituminous Macadam Roads

Bituminous macadam surfacing requires practically the same methods of patrol maintenance as surface treated macadam. The patrolman must watch the surface carefully and immediately repair every small defect that appears, using, if possible, the same quality of bitumen and stone used in the original construction. Life should be retained in the surface by the application of a light bitumen or surface treatment when necessary.

Concrete Roads

The patrol maintenance on concrete surfacing consists chiefly of keeping the earth or gravel shoulders in perfect condition and caring for the defects in joints and the cracks that appear.

The traffic has a tendency to push the shoulder material away from the edge of the concrete and the patrolman must add new material where necessary. Gravel is used, if available; if not, a clay-sand mixture may be used which compacts well and makes a very satisfactory shoulder.

The joints and cracks are treated at least annually by the county repair gang and the patrolman must repair the defects that occur after such treatment.

This work must be done as early in the season as weather conditions will permit. Neglect often causes considerable extra expenditure, as well as an unsightly surface.

Bridges

Make such temporary repairs to bridge floors, approaches and railings as are necessary.

Watch closely the abutments and protect them from scouring. Repoint all stone masonry where and when necessary.

Inspect the whole of the structures frequently and report to the division engineer or county highway commissioner if more extensive maintenance is thought necessary.

You may be required to paint the bridges in your section, if deemed advisable. Accumulations of dirt around the lower chords must be removed often. Rusting usually starts from this cause.

During flood periods watch closely all bridges and remove any drift wood or other matter that may have collected in or near the waterway.

Markers and Signs

Each patrolman should carry with him a supply of both white and black paint and the necessary brushes and stencils, in order that he may keep all markers and signs well painted and in good repair.

(To be continued)

Examination for County Engineers in Oklahoma

(Concluded from page 134)

II. A bridge 22 ft. wide crosses a stream on a 60 deg. skew. What is the approximate length of abutment necessary?

III. The short leg of a right triangle being 60 ft. and the smaller angle being 36 deg., find the lengths of the other sides, and the area of the triangle.

IV. Two angles of an oblique triangle are 27 deg. and 74 deg.; the side opposite the 74 deg. angle is 112 ft. Find the other angle, side and area of triangle.

V. (a) When section lines cross at an angle of 90 deg., how much extra land would be required to turn one corner on a center line radius of 125 ft., setting right of way line 33 ft. inside of center line and figuring original right of way was 66 ft. on each road centered on the section lines. (b) Describe accurately how you would set five stakes on right of way curve, your only instrument being a 100-ft. steel tape and a few stakes.

VI. (a) The inside diameter of a ⅝-in. steel cylinder is 54 in. The vertical inner lap being 2 in., and the height 15 ft., what would be the weight of the cylinder, assuming it to be of homogenous 490-lb. steel. (b) How many cubic yards of concrete would it take to fill it.

VII. The hypothenuse of a right triangle is 200 ft. One leg is 150 ft., what is the other leg? (Solve without tables or slide rule, showing computation).

VIII. How many cubic yards of concrete in a pier 28 ft. 6 in. by 6 ft. 7 in. at base, 22 ft. 2 in. by 3 ft. 3 in. on top and 19 ft. 7 in. high?

IX. Assuming flat top and 24-ft. roadway, with a fill of 4 ft. at Station 2 and 5 ft. at Station 3, side slopes 1½ to 1, what is yardage of fill from Station 2 to Station 3?

X. Radius of circle 180 ft., angle subtending chord 60 deg., what is the area of segment?

XI. With right of way at $100 per acre, and paving at $25,000 per mile, how much would be saved by going diagonally across a section, right of way being 66 ft. wide.

The Townsend Bill and Federal Aid

Senator Townsend Explains that Measure Does Not Interfere With Existing Laws

In answer to criticisms of the Townsend Bill on the ground that it would interfere with the existing federal aid law, Senator Townsend, its author, has issued a statement explaining the purposes of his bill, and pointing out that its passage would in no way affect the prosecution of work under the Federal Aid Road Act of 1916 and the amendments embodied in the Post Office Appropriation Bil lof 1919. His statement follows:

"The object of the bill introduced by me is to establish and maintain a national system of highways according to a national plan connecting the different states of the union, and affording an example of proper highway construction, which will be beneficial to the states. The bill does not in any manner injuriously affect existing law, in fact, it provides that the commission created under it shall have charge of the federal aid law, and shall make reports annually to the Congress as to what is being accomplished under existing law, and to make such recommendations for the future as the operation of the law and its results indicate to be necessary. The two systems of road building are separate and distinct, except that they are under control of the same federal commission. The appropriations, however, cannot be mingled, and the results will be known and properly appraised by the people from time to time. If the present federal aid law proves satisfactory, it will, as a matter of course, be continued, and probably enlarged. If the proven results are not satisfactory, that law will be discontinued. And what I say of the federal aid law will be true of the bill now pending before the Senate. The commission appointed under the law, it may safely be presumed, will be high grade men, representing different sections of the country, and their life-work will be to serve the people by furnishing the best possible highway transportation facilities."

◆

The Pennsylvania State Highway Department has announced that it will ask the police authorities for rigid enforcement of the Motor Vehicle Act on and after Sept. 15. The Department has arranged to put out a squad of inspectors, equipped with devices for checking and testing excessive weights, glaring lights and other infractions of the law. These inspectors will also be used to keep watch on second-hand dealers and public garages.

A Scarcity of Highway Engineers is resulting in great waste in road building, according to Dr. F. H. Newell, President of the American Association of Engineers. In a recent interview Dr. Newell said: "In general there is a good demand for engineers, but the greatest activity is in highway building. In this line there is a scarcity of experienced men. Much money is being wasted for this reason. The general enthusiasm for hard roads on the part of the public is apt to have a severe setback when the fact is discovered that many of the politically appointed boards of supervisors —not engineers—are wasting public funds on experiments or schemes not approved by skilled engineers. The public will not discriminate, and when the roads fail, as many must, the blame will fall inevitably on the engineer."

MEETINGS

Calendar of Coming Meetings

Nov. 12-14—American Society of Municipal Improvements. —Annual convention, New Orleans, La. Secretary, Charles Carroll Brown, 304 East Walnut St., Bloomington, Ill.

Feb. 9-13, 1920—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

PERSONAL MENTION

Le Grand Brown has been appointed deputy city engineer of Rochester, N. Y. Mr. Brown has been engaged in consulting work in California for several years.

Robert Thom, formerly county surveyor of Tuolumne County, California, has been made county engineer, the office of the county surveyor having been abolished.

Paul D. Pratt has resigned as chief engineer of the Montana State Highway Commission to become associated with the State Highway Construction Co., of Helena, Mont.

E. V. Camp, a consulting engineer of Atlanta, Ga., has been employed by the county commissioners of Murray County to have charge of road work in that county.

Sylvester Q. Cannon, City Engineer of Salt Lake City, Utah, has been relieved of the duties of superintendent of the Water Department, which he assumed during the war.

E. J. O'Hara, who has been in the employ of the Massachusetts Highway Commission for 22 years, during the past 15 years as chief clerk of the Automobile Department, has resigned to enter business.

John N. Edy, for some time assistant chief engineer of the Montana State Highway Commission, has been appointed chief engineer, to succeed Paul D. Pratt, whose resignation is noted elsewhere.

Capt. W. E. Darrow has been discharged from service with the 33rd Engineers and has returned to his position as assistant engineer in the New York State Highway Department. Capt. Darrow's headquarters are at Utica.

Frank H. Joyner, has been made chief engineer of the California Willite Road Construction Co. and consulting engineer of the Western Willite Road Construction Co., of Los Angeles. For several years Mr. Joyner has been road commissioner of Los Angeles County. Previous to that he was a division engineer of the Massachusetts Highway Commission.

Lt. Col. A. F. Foote, of Holyoke, has been temporarily placed in charge of the Automobile Department of the Massachusetts Highway Commission. Col. Foote has been a member of the examining and investigating force of the Automobile Department since 1907 and has been working for the Commission continuously, with the exception of the time served on the Mexican border and with the A. E. F. in France.

T. H. Johnson has resigned as city engineer of Sioux City, Iowa.

Harvey A. Tutewiler has resigned as assistant city engineer of Indianapolis, Ind.

H. E. Bilger has resigned as road engineer of the Illinois Highway Department to become consulting engineer of the Monmouth Stone Co., of Monmouth, Ill.

OBITUARIES

T. S. Plowman, president of the Bankhead National Highway Association, died recently.

Thomas Cole, who has been secretary of the Institution of Municipal and County Engineers of Great Britain for the past 33 years, died recently.

William P. Cunningham, regional manager of the Allied Machinery Co. of America, and formerly with the Lakewood Engineering Co., died recently at his home in Glen Ridge, N. J.

Alfred Farrand, who had been city engineer of Ventnor City, N. J., for the past five years, died on Aug. 4. Before becoming city engineer at Ventnor City, Mr. Farrand was city engineer of Atlantic City for fifteen years.

PUBLICATIONS

NEWPORT, R. I., STREET AND HIGHWAY DEPARTMENT. Annual report for the year of 1918. Paper, 6x9 in., 54 pages and covers.

This report comprises a detailed review of the operations of the department, largely in the form of statistics. It covers the construction and maintenance of roads and streets, snow removal, sprinkling, cleaning, dust laying and a variety of activities.

WISCONSIN, MILWAUKEE COUNTY HIGHWAY DEPARTMENT. Seventh annual report, for the year ending Dec. 31, 1918. Paper, 6x9 in., 60 pages and covers; illustrated.

The contents of this report include an organization chart of the Milwaukee County Highway Department; a brief review of the department's activities in 1918; a financial statement; detailed statistical reports on the various projects undertaken during the year, and many tables showing details of the work. It is well illustrated by several full-page halftones showing work completed and in progress.

WISCONSIN HIGHWAY COMMISSION. "Highway Maintenance." Bulletin No. 8, devoted especially to patrol maintenance on the state trunk highway system; compiled by J. T. Donaghey, Maintenance Engineer, Wisconsin Highway Commission. Paper, 6x9 in., 95 pages and covers; illustrated.

This bulletin is a very complete treatise on the maintenance of highways, published, it is stated, "for the information of those in charge of highway maintenance." It is intended especially for patrolmen, maintenance foremen and county highway commissioners. Its contents include a short introductory statement; sections describing methods of maintenance, and extracts from the road laws of the state of especial interest to patrolmen. Among the subjects covered in the various sections are: The erection of markers and signs; the maintenance policy of the State Highway Department; patrol maintenance of unsurfaced roads and of various types of surfaced roads; "Reminders to Patrolmen;" gang maintenance, and a chapter of miscellaneous facts and directions. It is profusely illustrated by views of maintenance work and its results and of the machinery used, and by line cuts showing the construction of drags and other implements.

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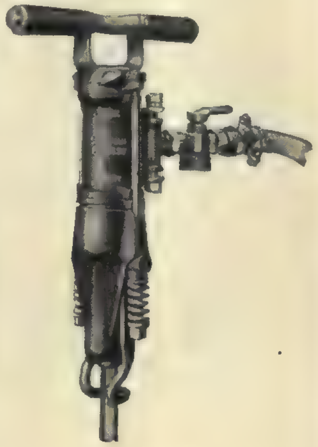

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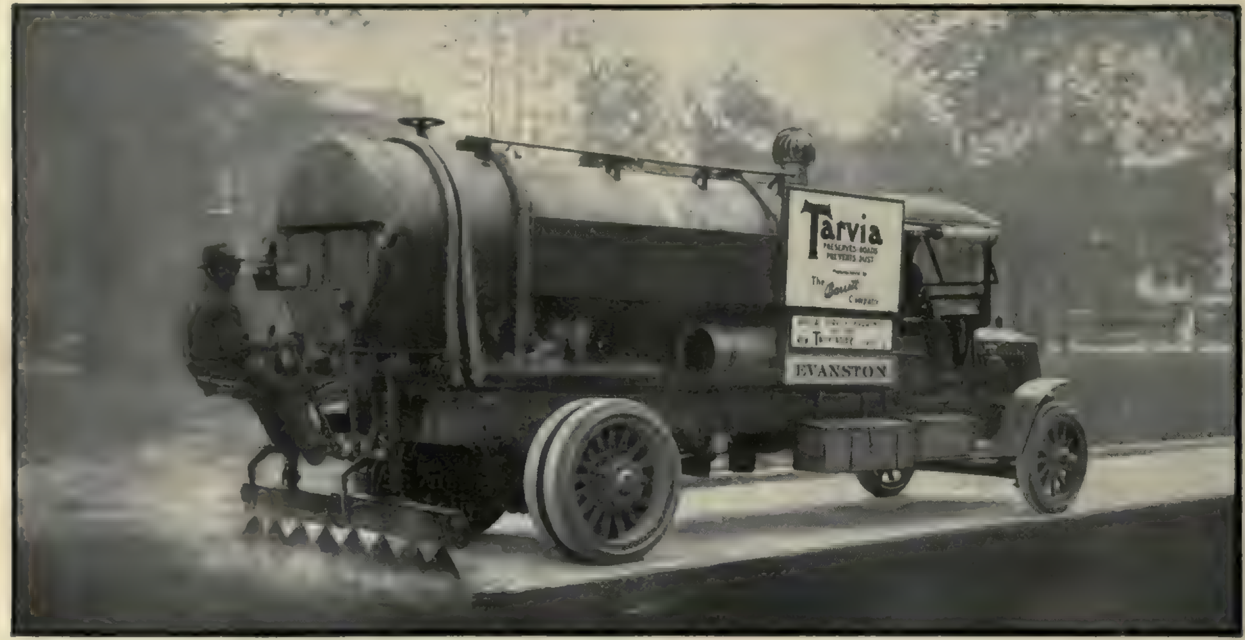

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> "I assure you that your efforts in our behalf are appreciated as we were able to keep our pavements in good serviceable condition despite the fact that they were subjected to unusually heavy traffic."

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WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVI.
New Series, Vol. XVIII.

NEW YORK, SEPTEMBER 17, 1919

Number 12

Highway Maintenance in Wisconsin—VI*

Gang Maintenance—Heavy Grading Work—Equipment and Methods—Resurfacing Stone and Gravel Roads—Bonding

Certain portions of many patrol sections are in such condition (due generally to lack of drainage) that they must be graded properly before the patrolman can maintain them at a reasonable cost.

Certain portions of stone or gravel road sections require repair or resurfacing by the application of new material; others require bituminous surface treatment, and many counties have appropriated additional funds for this purpose. To take care of these special places, each county must furnish the necessary heavy machinery and gangs to do the work. The county oiling gangs apply the surface treatments, moving from section to section.

Heavy Grading Work

Counties must furnish the necessary equipment early in the season in order that the work may begin as soon as weather conditions will permit. Equipment may be furnished in many counties from the regular construction machinery outfits.

Minimum Equipment Required.—One gas or oil tractor of not less than 30 hp. at draw-bar; 1 heavy grader with an 8 or 10-ft. blade; 1 road plow; 1 large slip scraper; 1

WELL MAINTAINED SURFACE-TREATED MACADAM ROAD IN SAUK COUNTY, WISCONSIN.

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*From "Highway Maintenance," Bulletin No. 8, Wisconsin Highway Commission, a publication devoted especially to patrol maintenance on the state highway system, compiled by J. T. Donaghey, Maintenance Engineer.

Fresno scraper; 1 heavy chain or cable, and the necessary small tools, such as shovels, picks, axes, bars, etc., including blasting tools. A wagon camp outfit or sleeping tent is necessary, as in many localities where this work is done it is impossible to get accommodations.

Crew.—The crew necessary varies with the class of work. The minimum, however, consists of one tractor operator, one grader operator, 1 team and driver, and 1 extra laborer. On sections where it is necessary to remove a large amount of trees, stumps or stones, extra men are required, and where necessary to move ahead to low places a considerable amount of dirt, extra teams and drivers are required.

Staking Out Work.—Before starting heavy blade grader work, the new center and ditch lines must be established and staked out by the patrolman or gang foreman, using measurements as shown in the standard maintenance cross-section.

The necessity for adopting a cross-section for earth road maintenance is evident. Probably 50% of the earth roads on the state trunk system will remain earth roads for many years, and if uniformity is ever to be attained they must be brought to a standard cross-section on those sections where heavy blade grader maintenance work is done.

The 6-in. crown shown we believe is sufficient in view of the fact that patrol maintenance follows. The flat crown has a tendency to distribute travel over the entire width of the roadway and avoid the necessity of driving on the center of the crown when the surface is muddy, which is imperative on heavily crowned clay roads in order to prevent skidding into the ditch.

Staking out must be done well in advance of the work, so that if it is found necessary to remove telephone poles, fences, or other obstructions, arrangements may be made with the owners and work not delayed after the maintenance gang has begun operations.

Stakes are set 50 ft. apart on the ditch lines and a light furrow plowed along them before starting grader work. The furrow is used as a guide to maintain the ditch line true to the center line. In order to get satisfactory blade grader work it is very necessary to have ditches and shoulders exactly the same distance from the center line at all points, except in heavy cuts. If the distance from the center line to either ditch or shoulder line is allowed to vary, there is always a surplus of earth at one point and a scarcity at others.

Operating Graders and Scrapers.—Where the road shoulders and ditches have not been plowed a sufficient length of time in advance to permit the decay of vegetable matter, the grass and weeds should be removed from the shoulders and ditches, preferably by using a sharp blade grader and cutting just under the crown of the grass roots. The grass and weeds must then be burned or removed to some point on the road where they will give added protection to bank slopes or sides of fills.

The first grader cut is made following the furrow previously mentioned, with the heel of the grader blade high and the blade set at an angle whereby the dirt moves freely towards the center of the road. Deposit the heavy sod, if there be any, under the shoulder of the road outside the traveled way, where it will not injure the surface.

The tractor drive-wheels should be equipped with rims not less than 24 in. in width and removable lugs not less than 3 in. in depth. The deep lugs are of great assistance in cutting up the heavy sod and thoroughly mixing the surface materials. The heavy lugs must be removed when traveling on surfaced roads.

Many grader operators attempt to move dirt toward the center of the road with the blade of the grader set too nearly at right angles to the machine, under which conditions it is impossible to do satisfactory work. The proper angle of the blade depends entirely upon the character and condition of the soil, the slope of the bank on which the machine is being operated and the point to which the dirt is being moved.

It is often economical on long sections to use two blade graders pulled by the same engine, one making the ditch cut and the other moving the cut in towards the center. After the second round with the grader is made, the slip scraper or Fresno is used to move the ridge of earth left behind the grader, where there appears to be an excessive amount, to some low point on the surface of the road.

All holes or low places must be filled in this manner before the grader is used to shape up the roadway proper. If the grading operations are done first and the holes and low places filled afterwards, they will nearly always appear better filled than they really are, and after the first rain the low place will still be noticeable and eventually will cause a mud-hole.

Sand roads should be graded somewhat wider and flatter than those on heavy clay soils. Where there is a top soil of a few inches in depth, which will make a reasonably good temporary wearing surface, the first grader cut should be made just outside the 24-ft. shoulder line and by successive cuts move in all the top soil from the shoulder to the ditch line. The top soil from both sides is generally sufficient to give a good depth of surface material. After the top soil has been thoroughly leveled and compacted, it should be covered with about 1 in. of sand from the ditches. The sand takes the wear and results in a more uniform and better wearing surface.

Finish.—The entire length of the section graded must be finished and left in a workmanlike manner and the ditches cleaned out so that the water will flow quickly and evenly away from the road.

If culvert ends are filled up from the grading operations, they must be cleaned out and left free and open, and all brush, weeds and grass burned in order that the patrolman may proceed with the maintenance of the section without extra labor on his part. If necessary, the patrolman may assist the county maintenance gang in moving to the next patrol section.

Resurfacing Stone and Gravel Roads

On stone or gravel roads which require resurfacing or heavy repair, the equipment includes, in addition to that mentioned, a scarifier, 10-ton road roller, sprinkling wagon, oil distributor, and, if local material is used, a portable crushing outfit, except where gravel is fine enough to use without crushing.

Shoulders.—When resurfacing is contemplated, the shoulders must be built up to a point where they will hold the new material in place. This is done either by bringing material from the ditches or by hauling in material, but the work must be done before starting the resurfacing work.

Pit-Run Gravels.—The surface must be scarified or spiked and thoroughly harrowed with a heavy peg-tooth harrow. The coarse stone coming to the surface is then removed. The surface is gone over several times with the road planer or light grader in order to fill the holes and low places before adding new material. The new material must be of a size passing a ¾-in. ring and having just enough fine or bonding material to fill the voids. If the finer material contains no bonding properties, a small amount of clay may be added. Where clay is used the surface should be well harrowed in order to mix the clay well into the gravel. The new material must be spread evenly to the desired depth and the light grader used to even up the surface.

Very satisfactory results are obtained by using gravel

GANG MAINTENANCE WITH TRACTOR AND HEAVY GRADER IN ONEIDA COUNTY, WISCONSIN.

containing little or no bonding properties. Where such gravel is used, the patrolman must go over the surface each day with the light grader or planer until it is well compacted.

If the gravel contains good bonding properties, the use of a road roller will result in a well compacted surface immediately. Where a roller is used, the surface should be thoroughly wet and when dry enough to permit, rolled until well compacted.

After opening to traffic, should ruts appear, the patrolman will remove them by use of the road planer or grader. Should the surface ravel, a small amount of clay may be added.

Stone and Gravel Macadams.—The preparation of the shoulders and surface is the same as above described for pit-run gravel.

The cheapest and best resurfacing material is fine gravel applied as described under pit-run gravels. Many miles of old 9-ft. stone macadam roads have been resurfaced successfully with fine gravel, and widened to 16 ft. at a very reasonable cost. The increased width is feathered out from about 3 in. in depth at the edge of the old surface to nothing at the outer edge of the new width.

Where crushed stone is used, the material should be of a size passing over a ½-in. ring and passing through a 2-in. ring.

Bonding with Water.—Where the new surface is bonded by the use of water, the material must be evenly spread to the desired thickness and rolled until the stone is thoroughly interlocked.

Stone screenings from ½ in. down to dust are then rolled into the voids remaining in the stone, and when completely filled, the whole surface is thoroughly flushed and rolled until hard and smooth.

The road must remain closed to traffic for 48 hours and when opened, the patrolman must give it very close attention for the first few weeks.

ROAD IN ONEIDA COUNTY, SHOWN AT TOP OF PAGE—AFTER GRADER WORK.

Under certain conditions a road may be surface-treated before opening to traffic, but it is generally considered good practice to allow the surface to cure and wear off the excess screenings down to the road metal before applying bituminous materials.

Bonding with Bitumen.—A light asphaltic oil or refined tar gives excellent results as a binder when intelligently used.

After the stone has been spread evenly and rolled until well interlocked, the voids are filled with stone screenings to a point that is a little less than flush with the surface of the stone. At this stage ½ gal. per square yard of bitumen is applied with a pressure distributor. Cover the surface lightly with stone chips from ½ to ¾ in. in size and allow 4 to 10 hours for penetration. Run the roller over the surface a few times to close up the remaining voids if there be any. Give the surface a second application of ½ gal. per square yard of bitumen, allowing 24 hours for penetration. Cover the surface with a sufficient amount of stone chipps to permit rolling the surface until well compacted and hard.

A seal coat of ¼ gal. per square yard of bitumen is now applied and the surface covered with fine stone chips or torpedo sand and again rolled.

The road may be opened for traffic after 24 hours and the patrolman must give it very close attention for a few days.

GANG MAINTENANCE WORK WITH LEANING WHEEL GRADER ON A WISCONSIN ROAD.

Keep the traffic from following in one track until the surface has become thoroughly ironed out and after the first week, this type of surface will require but little attention from the patrolman.

The cost will be not to exceed 15 ct. per square yard more than water-bound macadam after the first surface treatment has been given the water-bound macadam. At the end of the third year, this type will have cost less than a water-bound macadam surface treated each year, due to the fact that it will require less bitumen for each yearly treatment than will the water-bound macadam and will require much less maintenance by the patrolman. It will also require less thickness of stone to form the wearing surface.

The bitumen may be applied cold but preferably heated to about 100°, according to weather conditions.

An old 9-ft. macadam road may be widened to a 16-ft. by this method. The added width should not be less than 3 in. in depth when completed.

This type of road requires an annual surface treatment, but the danger of pitting out is practically removed.

(To be concluded)

The Service Man and Public Roads

The Resumption of Road Building as an Opportunity for the Returned Soldier—Government Encouragement of Projected Improvements—Success of the Campaign to Place Soldiers

By COL. ARTHUR WOODS*

As far back as 1916 the improvement of public highways in the United States began to wane. Several reasons account for the depression: Scarcity of labor, increasing cost of material and lack of legislation. Our activities were directed to other channels with the beginning of the war with Germany, and 1917 saw the closing of practically all good road construction. Only such operations as seemed of vital necessity were carried on in most states.

Now, almost a year after the armistice, the situation is vastly different. A wave of road building is sweeping over the country, the extent of which we have never previously known, and its breadth can hardly be estimated in figures.

Our returned fighting men stand as one of the major factors in this change. We are not to be satisfied with the success of their efforts in battle alone; a large army of workers, industriously carrying on a peace-time enterprise, is the result of our intention to see them win success in new fields.

Such intention was not arrived at by any hit or miss methods. We were casting about to find opportunities for our soldiers and sailors back from foreign shores or released from our own training camps, hundreds of thousands each month. Obviously, the first thing to do was to create new jobs for this sudden new supply of soldier labor—the old jobs could take care of themselves. But here was a state of affairs which offered a double opportunity—first, new good jobs for service men and, second, new roads for everybody. It surely looked like a good chance to open up new fields for fighters.

We took as a starter the Federal Good Roads Act passed several months ago. Now it remained to encourage the individual states to avail themselves of its opportunities and this has been accomplished in manner that has exceeded our hopes.

For more than three months a score of officers from our field staff have covered the United States, with one object, to open up the building of roads. As a result of their efforts, some $500,000,000 worth of public highway construction has been stimulated. Contracts for $150,000,000 of this sum have already been placed and, what is better, the real building is well in hand, and each month it continues to advance. So successful have been the efforts of the officers in charge, that we have been obliged to halt our compaign because men available to do the work have become limited in number, and sufficient machinery to carry on such enormous construction is not to be found.

At present the building of public highways is made possible in many instances by the use of Government transport material. The Department of Agriculture makes the distribution of the equipment to the states according to their allotment of funds coming from the Federal Good Roads Act. The state highway commissioners throughout the country have thus far received approximately 30,000 vehicles, ranging from automobile runabouts to tractors, and practically all of the road building machinery hitherto used in camps. Thousand of trucks for transporting material are now in use in practically every state, due to an arrangement between the Motor Transport Corps and the Department of Agriculture. No small amount of material remains in France, and as soon as ships are available to carry it back to this country, it is probable that more machinery may be assigned, which means more roads and more jobs.

After months of training in camps and service at the front, thousands of men find it impossible to return to their old indoor vocations, which confine them to offices, shops or factories. The open life of the past two years has been too invigorating—the prime result is a new spirit of energy—the craving for opportunity to tackle Nature's obstacles, to open other land by road construction, to burst into new work. These opportunities, I feel, permit us to repay our gallant men a tithe for the sacrifices they have made. At the same time it is helpful to them and of lasting value to the country.

The Sundry Civil Act, passed July 19, 1919, prevents the transfer of any additional motor transport material to the Department of Agriculture. And yet this has not affected the progress of new construction. Our large orders for surplus equipment have not been entirely filled, and before any slacking of the work can be felt, Congress will make possible the same transfer of trucks and machinery not necessary in the carrying on of Government work.

Not all our home-coming fighters are yet adjusted to civil life occupations, and so I look to the advancement of highway construction in even larger proportions to assist in placing them. And so, this project fills at one time two big needs—better jobs and better roads.

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The New Jersey State Highway Commission is to take over the work of contractors who are slow in completing their contracts, according to a recent report from Trenton. This action has been decided upon in order to expedite work on the construction of the state highway system. Another decision reached by the commission is to require of every contractor submitting a bid for state highway work, a certified check for 10% of his bid, as well as the customary bond.

Paving Brick Production in 1918 was the lowest since 1896 and was about 40% of the maximum annual production, reached in 1909, according to statistics on clay products published by the U. S. Geological Survey. This is ascribed to the embargoes on rail shipments, fuel restrictions and high freight rates of the war years. The quantity marketed in 1918 was 403,512,000 blocks, a decrease of 303,422,000, or 43%, as compared with 1917. The value was $7,232,000, a decrease of $3,433,000 or 32%.

According to the Massachusetts Highway Commission, $1.00 does not build any more road today than 45 ct. did in 1915, this estimate having been submitted to the Commission by one of its engineers. It is pointed out that the $6,000,000 available for new construction in 1920 will not suffice for the building of as great mileage as the average citizen might expect. A first-class bituminous road, 18 ft. wide, costs about $35,000 a mile at present, according to Commissioner Synan, while in 1914 or 1915 a similar road could be built for from $15,000 to $16,000 a mile.

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*Assistant to the Secretary of War; former Police Commissoner of the City of New York.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
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LARGER CONTRACTS

Road work offers no exception to the rule of small beginnings. Until comparatively recent years it amounted to very little indeed. When a real beginning was made, less than twenty-five years ago, water-bound macadam was the highest type of surfacing used on ordinary country roads and the three-wheeled road roller was about the most complicated and costly piece of machinery in use. An intelligent laborer who could acquire a few teams and small tools could undertake and successfully carry out a road contract.

As road contracting has grown in importance and in its demands for ability, equipment and financial responsibility, the contractors engaged in it have not developed commensurately. This has been due in no measure to the contractors themselves, but to conditions. Road work heretofore has been done by what has commonly been referred to as the "patchwork" system, each individual piece of work being small and the different jobs being widely separated. Naturally, a contractor could not afford to utilize the most efficient equipment on such work, for the most efficient equipment meant expensive and not readily portable plants of various kinds. The volume of work he could do, and consequently its value, did not justify the heavy investment required to obtain the requisite machinery, nor did the amount of service he could get from the equipment on many scattered jobs warrant its employment.

Since the same reasons that have prevented the smaller contractors from growing have also kept the larger concerns pretty well out of the field of road contracting, highway work has continued to be done largely by small firms, headed, in the main, by able men, but unable to expand their business. This, more than any other one cause, we believe, has been responsible for the unsatisfactory condition of the road contracting business.

Now that materially greater funds available for road work are permitting the undertaking of more extensive road improvement programs than ever before, we are glad to note that work is being let in much larger units. This is as it should be, and undoubtedly will result in an immeasurably better quality of work. When a contractor can get several miles of road to build at a price up to $50,000 a mile, he can well afford to utilize elaborate and efficient plants in its prosecution. And the larger the units the more marked will be the advantages. The contractor will be enabled to expand his operations and to make a larger profit, even at lower prices. The public will get roads at a lower cost than that of less well built roads under the former system.

THE ADAPTABLE TRUCK

One of the most striking examples of the material progress of the past quarter century is the present use of the motor truck, in interestate and local transportation of freight. Although the development of the motor truck was slow until the exigencies of war brought it to the fore, trucks in this service are now numbered in the hundred thousands.

No less remarkable than the number of trucks in service is the variety of uses to which the machines are put; indeed, the adaptability of the truck seems limitless. Not only is it used for the ordinary hauling of commodities over the country's roads and the streets of the cities, but it is constantly being utilized to solve some unusual transportation problem. Two such cases are noted in this issue. In one, a truck—or, to be exact, a tractor—was used to carry a logging locomotive between two jobs that were not connected by tracks. In the other case, trucks were used to carry high explosives over well-nigh impassable roads from a railroad station to a magazine back in the mountains. From time to time similar unusual performances have been noted in these and other columns, some of them being remarkable even in these days of extraordinary things.

The possibility of using the truck in so many different ways is very largely responsible for its wide use. Almost as flexible as the horse-drawn vehicle and immeasurably greater in capacity, it is largely replacing the horse and wagon in urban and rural hauling and is making great inroads upon the business of the steam and electric railroads, particularly in short-haul work. It has used the roads and it has helped build and maintain them. Contractors and highway departments have used it to haul graders, drags and other road building machines; to haul material to and from construction jobs; to bring in and carry out all sorts of equipment, from small tools to locomotives; and to transport laborers to and from work. It has been used to bring the products of the fields and farms, the orchards and the ranges to the city markets and to carry farm machinery and supplies, household goods and food to the farmer. The Post Office has used it to carry parcel post matter and the Army has used it to carry munitions and supplies in this country and in the theater of war overseas. There is probably no class of hauling, usual or unusual, in which it has not been utilized.

And the truck's activities are not confined to any one section or season. It has proved its worth in the snows of the New England winter and in the heat of summer in the Southwest. It has demonstrated its value in the mountains and on the prairies. Wherever passable roads have been provided—and sometimes where the roads were hardly passable—the truck has gone back and forth on its appointed errands, in spring and fall, summer and winter, in the North, the South, the East and the West.

When the Germans were advancing towards Paris in the early days of the Great War, the big truck and the little taxi did their part in stemming the tide. Later, when the gray-clad hordes menaced Verdun, the uninterrupted stream of trucks over the road to the threatened city enabled the defenders to fulfill the French vow, "They shall not pass!"

Now that this country has turned again to the pursuits of peace, it faces tasks quite as compelling as those of the past two years of military effort. A part, at least, of the solution lies in greater production, and in this the truck seems destined to again play a leading part.

Illinois Bankers Back Good Roads

Committee on Good Roads of the Illinois Bankers' Association Reports on Work of Year—Tribute to Superintendent Bradt

The Illinois Bankers' Association, which numbers among its members William G. Edens, Chairman of the Associated Road Organizations of Chicago and Cook County, and S. E. Bradt, State Superintendent of Highways of Illinois, has taken an active interest in road improvement for a number of years. At the 29th annual convention, held in Chicago early this month, the association's committee on good roads, of which Mr. Edens is chairman, presented a report on the activities of the organization along that line during the years 1918-19. The text of the report follows:

We present herewith the annual report of the Good Roads Committee of the Illinois Bankers' Association for the years 1918 and 1919. With the close of the campaign for the $60,000,000 good roads bond issue, which was voted on at the general election, Nov. 5, 1918, and which won the hearty approval of the people of Illinois, much of the work of our committee was finished.

We beg to express our earnest appreciation of the work done in behalf of this measure by the officers, members of the executive council and the members of our Association throughout the state, who, during the past six or seven years, have so energetically supported the good roads movement.

Remembering that our Association was one of the first in the United States to take up seriously and study the subject of improved agriculture and vocational training, we also recall that it was through this activity that our good roads committee was developed.

We feel that the benefits derived by the farmers from the county agent system have fully justified that legislation, and that in due time the entire school system of Illinois will be so improved that the youth of all sections of our state will have equally as good district schools with practical courses, bringing the understanding of agriculture to our people generally, as well as instruction in other vocations. This, it seems to us, will come true when the 5,000-mi. system of good roads provided for in the $60,000,000 bond issue law has been built.

The loyal support of our membership in helping to secure the passage of the Tice Law which lifted us out of the old system of road construction and maintenance, recognizing the principle of equal expense by the state and county for important, inter-county connecting highways, and which also brought into existence the office of county superintendent of highways, was an achievement which has brought about splendid results in road building and maintenance in nearly every county.

Many state and county road officials, at the outbreak of war, enlisted with the colors and gained a new experience in road building, either in camps in our own country or as a result of their service overseas, and this experience, it seems to us, is bound to be of advantage to the State Highway Department and the highway departments of the various counties.

You may be interested in knowing that since the bond issue election in November, 1918, copies of the $60,000,000 bond issue law and samples of the printed matter that we distributed during the campaign, have been sent to people residing in 32 different states, in many instances to the governor or other important state officials who are conducting or contemplating campaigns similar to our own. In addition, we have sent this information to the Board of Public Works of Tokio, Japan, to the Town Planning and Road Making Commission of Australia and to the Calgary Good Roads Association of Alberta, Canada.

Scarcely a day passes that we do not receive requests by mail or personal calls from people residing in other states, seeking information or advice with respect to road building plans and campaigns for bond issues. Therefore, it seems to us that we may feel a just pride in the Illinois situation as compared with the condition that prevailed for nearly 100 years—one which the residents of our state when going abroad, and especially since the motor car came into general use, always deplored in the knowledge of our bad road conditions. These changes could not have been brought about without the splendid support of the men and women of Illinois, who have generously given of their time and means in organizing public sentiment in behalf of this cause.

It seems hardly proper for us to close this report without calling special attention to the services given by one of our own members, Mr. S. E. Bradt, Vice President of the First National Bank of DeKalb, and now superintendent of highways for the State of Illinois.

Mr. Bradt's business training and his broad experience in dealing with and knowledge of local conditions in his home city and township, particularly as it related to drainage and roads, made him the ideal chairman of our first committee on good roads. Then his selection by former Governor Edward F. Dunne as member of the State Highway Commission created under the Tice Law, brought to the advantage of the state this special fitness and experience, without which the first commission might have failed in its initial undertakings. The good judgment displayed by Governor Frank O. Lowden in retaining the services of Mr. Bradt as superintendent of highways under the modified code act, has given his valuable, continuous services to the state for a period now of nearly seven years.

We can recall no better example of efficiency, citizenship or patriotism than that displayed by the public services rendered by our friend and associate. To him, possibly more than any other citizen of our state, we think it only fair to say, the changed conditions and favorable public sentiment are largely due. His ability to promote a spirit of cooperation and practical action, resulting in legislation which gave the people the opportunity to vote on the $60,000,000 bond issue brought us to the climax of our good roads efforts in Illinois, and we believe this convention should show by proper action in its records its appreciation of the loyal and energetic efforts put forth by Mr. Bradt in the discharge of his official duties.

Cook County, Illinois, Plans Extensive Road Work

Strong Efforts Being Made to Bring a $5,000,000 Road Bond Issue Before the People at the November Election

The Associated Road Organizations of Chicago and Cook County and other local interests are making strong efforts to have the matter of a $5,000,000 road bond issue brought before the voters of the county at the November election.

County Superintendent of Highways Quinlan is working on the road program for the county, which he expects to bring before the board of county commissioners at an early date.

Within the county, outside the City of Chicago, there are 1,529 mi. of public highways. The state has selected 382 mi. for construction by state aid and has designated 147 mi. as a part of the state system to be built with the proceeds of the $60,000,000 bond issue. In addition 21 mi. have been selected for federal aid. While this makes a total of 550 mi., there is little likelihood of that amount of road being improved, since many of the roads selected as parts of the state system and those included in the 21 mi. for federal aid are identical with those included in the 382 mi. on which state aid will be given.

During the past six years 40 mi. of road have been constructed by state aid and 136 mi. have been built or are under construction with county funds. In addition, there are 21 mi. included in federal aid projects now under way. Of the 136 mi. of the county built roads, 86 are in use and the other 50 are under contract.

The $5,000,000 county bond issue, if voted, is expected to add 170 mi. to the improved mileage of the county.

Maine Voters Authorize Bonds

Election on Monday, September 8, Raises Legal Limit of Road Bonds to $10,000,000

At an election on Monday, September 8, the voters of Maine endorsed the proposal to raise the bonded indebtedness for state highways from $2,000,000 to $10,000,000. This makes possible the issuing of $8,000,000 of new bonds.

The proposal was carried by a vote of about 5 to 1, indicating the people's approval of the work done with the funds obtained from the original of $2,000,000 bond issue.

Big Massachusetts Contract Let

State Highway Commission Has Awarded a Quarter-Million Dollar Contract for the Building of the Mohawk Trail Approach

The Massachusetts Highway Commission on Sept. 2 received bids for the construction of the new road around Shelburne Mountain, between the towns of Greenfield and Shelburne Falls. This road is an approach to the Mohawk Trail, the proposed improvement of which was noted in "Good Roads" for May 31. The price made by the successful bidder, Coleman Brothers, of Boston, was $253,808.15.

The road is about 5⅛ mi. long. It follows the existing highway for about 2½ mi., the remainder being on an entirely new location. The maximum grade of the present road around the mountain is 11½%, while the maximum grade of the new road will be 6%. This reduction of grade necessitated increasing the length of road between Greenfield and Shelburne by about 1½ mi. The road will be built of cement concrete. The state will receive $20,000 a mile toward the construction from the Federal Government, and it is expected that work will be commenced in the near future and will be completed by the fall of 1920.

The contract is the largest, from the standpoint of price, of any ever awarded by the Massachusetts Highway Commission.

Resolution for the Continuance of Motor Truck Distribution

Senator Hoke Smith Introduces a Joint Resolution for Continuing Transfer of Trucks to States for Federal Aid Work

In order to prevent the stoppage of the transfer of surplus motor trucks from the War Department to the highway departments of the various states for use in federal aid work, in accordance with the Post Office Appropriation Bill of 1919, a joint resolution has been introduced in Congress by Senator Hoke Smith. As noted in "Good Roads" for Sept. 10, a recent ruling by the Judge Advocate General of the Army held that further transfers could not be made unless Congress specifically authorized it. Senator Smith's resolution, which is intended to accomplish this purpose, follows:

RESOLVED, By the Senate and House of Representatives of the United States of America in Congress assembled: That nothing contained in Section 5 of the Act entitled "An Act making appropriation for Sundry Civil Expenses of the Government for the fiscal year ending June 30, 1920, and for other purposes," approved July 19, 1919, shall be construed as in any way affecting the transfer free of charge of motor-propelled vehicles and motor equipment and other war material, equipment and supplies not needed for the purposes of the War Department, pursuant to Section 7 of the Act entitled "An act making appropriations for the service of the Post Office Department for the fiscal year ending June 30, 1920, and for other purposes," approved February 28, 1919; and it is the intent of Congress that this shall mean all equipment and materials which can be used in the construction and maintenance of roads, that the provisions of the Act July 16, 1914 (36 Stat. 454), prohibiting the expenditure of appropriations by any of the executive departments or other Government establishments for the maintenance, repair or operation of motor-propelled or horse-drawn passenger carrying vehicles in the absence of specific statutory authority, shall not apply to vehicles transferred, or hereafter to be transferred, by the Secretary of War to the Secretary of Agriculture, for the use of that Department, under the provision of Section 7 of the said Act of February 26, 1919; and that the Secretary of War is authorized and empowered in his discretion to transfer free of charge to the Post Office Department for use in the transmission of mails such motor vehicles and motor equipment pertaining to the military establishment as are or may hereafter be found to be surplus and no longer required for military purposes.

Nebraska Highway Divisions

State Highway Department Divides State Into Five Districts for Administration of Highway Work—The Appropriation to Each District—Names of the Engineers

The Nebraska State Highway Department has divided the state into five divisions to facilitate the administration of road work and has made an apportionment of the available funds.

The first division includes the counties in the southeastern part of the state and has an appropriation of $3,346,666.99. The second division includes all the counties east of Cherry County, turning at Antelope, Madison and Platte Counties and then running east on the north side of the Platte River to the Missouri River. The apportionment for this division is $2,714,524.03. Division three is situated in the southwestern part of the state and is bounded on the west by Perkins, Chase and Dundy Counties and on the east by Clay, Adams and Nuckolls; the appropriation is $1,650,902.08. Division four is situated in the central section of the state and has an appropriation of $2,055,227.22. Division five is situated in the extreme western part of the state extending as far east as Sheridan, Grant, Arthur and Keith Counties and has an appropriation of $1,372,886.73.

The division engineers, with their headquarters, are as follows: Division 2, M. F. Black, Norfolk; Division 3, R. O. Green, Hastings; Division 4, R. L. Cochran, North Platte; Division 5, J. C. McLean, Scottsbluff.

State Maintained Highways in Maryland are being marked by whitewashed telephone and telegraph poles. The primary object is to indicate whether the state or the local authority is responsible for the maintenance of the road.

Arkansas County, Arkansas, is to have a macadam road 85 mi. in length, costing $1,690,000, according to a recent report. A contract for the work has been awarded to the Southern Improvement Co., of Little Rock. The road will traverse the towns of Almyra, Gillett, St. Charles and Dewitt.

The Attorney General of Kansas has filed ouster suits against seven cement companies doing business in the state, following an extensive investigation based on charges that the companies have formed a trust in violation of the state laws in order to fix cement prices. The petition asks that charters, franchises and business rights of the companies be forfeited; that restraining orders against the continuation of the combination be issued; that the property of the companies be placed under the control of the court; that receivers be appointed, and that each company be fined not less than $100 for each day it has violated the anti-trust law. According to the charges made, the companies agreed not to sell below a standard price, which is alleged to be excessive; they agreed to sell cement at a standard price, adding to it certain railroad freight charges, and they agreed to divide the state among them.

HIGHWAY TRANSPORTATION

Trucks and Trailers in City Service

Boston Trucking Company Doubles Tonnage and Triples Radius of Operation in Three Years by the Use of Trucks and Trailers

A particularly striking illustration of the efficacy of motor trucks and trailers in city and suburban trucking is furnished by the experience of Youlden, Smith & Hopkins, one of the largest trucking companies in Boston, Mass.

This company was established in 1891 with two horses and a cash capital of about $500. From the first, the efforts of the officials were bent towards securing its customers from among the best business houses in the city, and little by little, the business increased, until in 1916 the company was handling approximately 500 tons of freight within a radius of about 10 mi. of its main office. At that time it used 150 horses and from 45 to 75 drivers.

The motor truck was then beginning to be recognized as an economical means of hauling, and the officials of the company saw an opportunity for a considerable expansion if it could give its customers quicker and better service and could extend its operations into the suburbs within a radius of 30 mi. In order to carry out this plan, two 5-ton trucks were purchased and placed in service on the longer hauls, leaving the short haul business for the company's horse-drawn equipment.

A UNIT OF THE FLEET OF MACK, PACKARD AND PIERCE-ARROW TRUCKS AND TROY TRAILERS OPERATED BY YOULDEN, SMITH & HOPKINS.

The plan proved successful, and more trucks were purchased, each one replacing four horses. Trailers were also added to the company's equipment, and also proved their value, especially in long distance work.

According to one of the company's heads, no difficulty has been experienced in operating the trailers anywhere within the territory covered by the trucks, and the operating expenses for this kind of work have been materially reduced.

The company now handles 1,000 tons of freight daily during the busy season, the increase being partly due to the improved facilities and partly to the practice of advertising, which is handled by a fund consisting of a certain portion of the income. During the past year the advertising expenditures amounted to approximately $5,000.

The present equipment consists of thirteen 5-ton Mack, Pierce-Arrow and Packard trucks; two 2-ton trucks, three 5-ton Troy trailers and 120 horses. The horses are used in local service.

The company maintains two offices in the city, a stable in South Boston, another in East Boston, and a third in Somerville, the three having a capacity of 140 horses. It also operates its own garage with a floor space of 24,000 sq. ft. and a capacity of 50 trucks. The rates charged for suburban hauling are between the corresponding freight and express rates.

Carrying a Locomotive by Tractor and Trailer

One of the many unusual uses to which the adaptable motor truck can be put in a pinch is shown in the accompanying illustration of a tractor and a trailer hauling a logging locomotive.

The locomotive is the property of the Clipper Shingle Co., of Bellingham, Wash., and is shown ready for transportation from one of the company's timber claims to another. There was no railroad between the two jobs and the problem of moving the locomotive was solved by the utilization of a Garford 10-ton tractor and a trailer.

GARFORD 10-TON TRACTOR HAULING TRAILER CARRYING A LOGGING LOCOMOTIVE BETWEEN JOBS IN THE FORESTS OF WASHINGTON.

Freight and Passenger Highways

American Automobile Association Official Advocates Roads of Different Capacities and a Segregation of Traffic Enforced by a Traffic Officer of Highway Department

Freight roads and passenger roads are probabilities of the comparatively near future in the congested sections, according to Chairman George C. Diehl, of the Good Roads Board of the American Automobile Association. This statement was made in a recent communication from Mr. Diehl to General W. M. Black, Chief of Engineers of the War Department, part of which follows:

"There will never be a time when all roads are of equal durability and carrying capacity. Highways and railroads are analogous in that they are both designed to carry traffic, and general rules which have been developed through scientific management of railroads apply as well almost invariably to highways. The heaviest locomotives and rolling stock are carried on roads like the New York Central and Pennsylvania and Union Pacific. Their use over lighter constructed railroads would ruin the roads in a comparatively brief period.

"There must come a classification of highways. Over Class 1 the heaviest motor trucks and trailers would be permitted; each truck should have large figures conspicuously placed on the sides to indicate the total weight that it was permitted to carry; operators and owners of the trucks should be prosecuted for using the heaviest trucks on roads designed for lighter traffic. It would be comparatively simple to enforce such provisions, as there seems to be no defense of the proposition of permitting one or two heavy trucks to ruin an investment of many thousand dollars on the lighter constructed highways.

"At road intersections the highway capacity would be indicated, as the highway department should, I believe, have a traffic department under a chief traffic engineer, having to do, not with construction and maintenance, but merely with the control of traffic. It is extremely likely that it would result ultimately in a system of freight roads and passenger roads, and that wider and parallel roads would be found to be the most economical method of laying out the highway system.

"It is impossible to lay out all roads of the heavy form of construction. In the first place, the money is not available and, secondly, too many years would elapse before the sparsely settled sections of the country were developed. It would not be at all difficult to break bulk when leaving the heavy traffic roads, and in a comparatively brief time an excellent theory of highway construction would be developed whereby each locality would be able to determine the amount it was feasible for it to expend on each mile of highway construction."

Hauling TNT Over Rocky Roads

Thousands of tons of TNT are being stored by the Government on the top of Mt. Pocono in Pennsylvania. It is brought by train to Tobyhanna and then hauled 12 mi. through the woods to the magazines by 40 F. W. D. trucks and 15 caterpillar tractors.

An idea of the roads over which the explosive has to be carried can be obtained from the accompanying illustrations. They are so bad, it is stated, that a set of solid rubber tires lasts only 1,000 mi., while ordinary fabric tires can not be used at all.

Marines Adopt Nash Quad

The Nash Motors Co., of Kenosha, Wis., has announced that its 2-ton machine has been adopted by the Marine Corps Standardization Board as the standard duty truck for expeditions.

These machines have been used by the Corps for several years, and at the time the standardization was decided upon the Marines were operating 400 of them. More are being added rapidly.

Trucks Live Miles, Not Years

Manufacturer Believes Service Rendered by a Motor Truck Should Be Measured by Miles Traveled, Not by Its Years of Use

The service rendered by a motor truck should be gauged by mileage and not by years of use, according to the White Company, manufacturer of the White truck. This company has recently been investigating the performance of its machines and has found so many that have covered more than 100,000 mi. that it believes that that mileage, which was once considered remarkable, has now become commonplace.

As examples of service rendered by machines, the company recently cited a number of instances in which mileages of 100,000 mi. or more have been made by White machines. Two trucks owned by Armour & Co., and used in Spokane, Wash., have exceeded the 100,000 mi. mark, as has also a machine owned by the East Ohio Gas Company of Cleveland, O. Another, owned and operated by the Los Angeles Gas & Electric Corporation, of Los Angeles, Cal., has made 131,728 mi., while one owned by the Tri-State Telephone & Telegraph Company, of St. Paul, Minn., made over 200,000 mi. Three trucks used in newspaper delivery are mentioned. The "Memphis News-Scimitar," of Memphis, Tenn., and the "St. Paul Daily News," of St. Paul, Minn., each own a machine that has made over 100,000 mi., while one owned by the "Montreal Gazette," of Montreal, P. Q., has made 140,000 mi.

The largest mileage cited is that made by a truck owned by Wouters' Laundry, of Chicago, Ill. This machine has made more than 300,000 mi. A truck doing similar work

What Some of the Road Is Like.

F. W. D. Truck with Load of TNT.

HAULING HIGH EXPLOSIVES OVER PENNSYLVANIA MOUNTAINS.

and owned by the Westfield Laundry, of Westfield, Mass., has made 200,000 mi. and two machines operated by the Waltham Laundry of Waltham, Mass., have made over 100,000 mi., each.

The Emerick Bus Line Company, of Bellefont, Pa., and Madary's Planing Mill, of Fresno, Cal., each have a fleet of six White trucks with mileages of from 120,000 to 150,000 mi. for each machine, while seven trucks owned by Sterling & Welch, furniture dealers in Cleveland, O., have records ranging from 101,250 to 139,250 mi. In the fleet of machines owned by the White Transit Company, of Plymouth, Pa., there are 15 machines with mileages of from 132,400 to 242,200.

These instances, according to the White Company, are typical cases selected from a large number and without effort to indicate the variety of lines in which the machines are making large mileages. As a matter of record, it is stated, machines are known to have exceeded 100,000 mi. in services that take in 49 lines of business.

MEETINGS

Calendar of Coming Meetings

Nov. 12-14—American Society of Municipal Improvements. —Annual convention, New Orleans, La. Secretary, Charles Carroll Brown, 304 East Walnut St., Bloomington, Ill.

Feb. 9-13, 1920—American Road Builders' Association— Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Missouri Valley Road Builders' Association

The Missouri Valley Road Builders' Association was organized at a meeting of contractors, representatives of material companies, and county, state, municipal and federal engineers, held at the Baltimore Hotel, Kansas City, Mo., on Tuesday, Sept. 2.

The main purpose of the organization is to promote the welfare of the highway industry and to attempt to place it before the public on the same basis as other industries. One of its aims will be to bring about closer cooperation and a better understanding among contractors, engineers, highway officials and commercial interests.

Officers were elected at the meeting as follows: Chairman, M. W. Watson, State Highway Engineer of Kansas; Secretary-Treasurer, M. R. Amerman, contractor, Salina, Kansas; Executive Committee: Chairman Watson; Secretary-Treasurer Amerman; S. A. Fones, of the Independent Gravel Co., Joplin, Mo.; A. W. Graham, State Highway Engineer of Missouri, and R. E. O'Brien, of the Cook & O'Brien Construction Co.

As it is felt that the various interests concerned with road work should come together at intervals and discuss their problems, it is planned to hold meetings of the organization on the third Saturday of each month at the Baltimore Hotel, Kansas City. The present efforts of the association will be directed largely toward obtaining recognition of highway work from the Railroad Administration, and the procuring of proper car service.

Illinois Bankers' Association

The 29th annual convention of the Illinois Bankers' Association was held at the Hotel La Salle, Chicago, Ill., on Thursday and Friday, Sept. 4 and 5.

Among the matters taken up at the meeting was the report of the Committee on Good Roads, the text of which is printed on other pages of this issue. This committee consisted of William G. Edens, Chairman; J. A. Cathcart, H. S. Cable, J. B. Jackson and A. M. Kenney.

PERSONAL MENTION

H. M. Huntington has resigned as city engineer of Sheridan, Wyo.

Charles C. Smith has resigned as city engineer of San Angelo, Texas, and has been appointed county engineer of Schleicher County, Texas.

Lieut. Frederick Wheeler, of the Engineers, U. S. A., has been discharged from the service and is now a chief of party with the California Highway Commission.

Prof. Charles M. Strahan, of the Engineering Department of the University of Georgia, has been appointed chairman of the Georgia State Highway Commission.

Robert W. Priestman, for several years first assistant city engineer of Lawrence, Mass., has been appointed city engineer, succeeding Arthur C. Marble, resigned.

Lieut. Waldo H. Chase, who was recently discharged from service with the 115th Engineers, has returned to his position as engineer with the northern division of the California State Highway Department.

Fred Oehler, of Clarkston, Wash., has formed an engineering partnership with C. C. Van Arnsdoll, also of Clarkston, Wash., and E. M. Booth, of Lewiston, Idaho, and will specialize in highway construction work.

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E. M. Booth, of Lewiston, Idaho, has formed an engineering partnership with C. C. Van Arnsdoll and Fred Oehler, of Clarkston, Wash., and will specialize in highway construction work. Mr. Booth was formerly state highway engineer of Idaho.

U. S. Marshall has resigned as senior highway engineer of the Bureau of Public Roads, U. S. Department of Agriculture, to become assistant chief engineer of the Montana State Highway Commission. Mr. Marshall until recently had charge of the Missoula branch office of the bureau and is the author of the report on cantonment road building at Camp Lewis, Washington, printed in "Good Roads" for Sept. 3 and 10.

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CONSTRUCTION TRANSPORTATION MAINTENANCE

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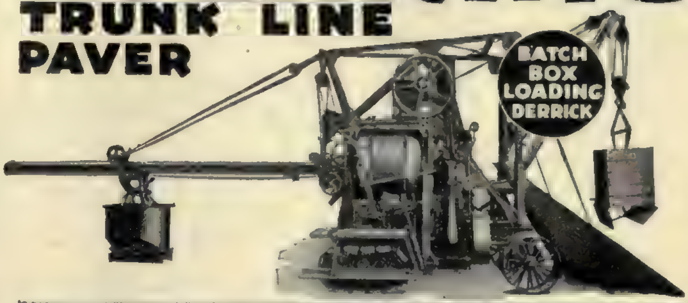

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CONSTRUCTION TRANSPORTATION MAINTENANCE

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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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The Classification of Highways*

Advantages of Improved Roads—Necessity for Classification of Country's Highways—Description of the Several Classes and Estimates of Cost of Improvement and Service Rendered

By HENRY G. SHIRLEY†

Not many years ago the "Classification of Highways" would have been looked upon with skepticism, but sentiment has been growing stronger and stronger for improved roads until it has reached a point where the people are demanding action and a classification of roads so as to speed up construction. The large mileage of unimproved roads in this country and the enormous amount of money that would have to be expended to improve and surface this mileage with a stable surfacing would place too great a financial burden on our people. It is, therefore, essential and necessary that a selection be made from this mileage and the roads be classified as to their availability to render the greatest public service. This service and its importance must be considered from the total benefits derived and the many usages for which the road will serve. It may be well at this time to pause and examine a few of the advantages derived from the classification and the improvement of roads and why a classification should be made. The saving in the cost of haulage of the products from the farm, forest and mines would be from $500,000,000 to $600,000,000 annually, and if passenger traffic were considered it would reach $1,000,000,000 per year.

The horse, our past universal highway power unit, traveled from 3 to 4 mi. per hour, whereas a motor travels from 18 to 24 mi. per hour, or from five to six times as fast as the horse and saves from five to six times the time. When the value of the time saved is put into dollars it will run into an enormous sum. Property values will increase and school attendance will be more regular, making the teacher very much more effective with the scholar. The church, the doctor, the hospital, the store, the court house, the mill,

HEAVY TRAFFIC ON A MAIN TRUNK HIGHWAY IN THE STATE OF OHIO.

AN ARGUMENT FOR NATIONAL ROADS—CONDITIONS AT A STATE LINE.

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*From a paper presented at the 20th annual convention of the North Carolina Good Roads Association, Harbor Island, N. C., Aug. 13-15, 1919.

†Secretary, Federal Highway Council.

the town, the movie, our neighbors and friends are all brought nearer to us and we can enjoy their friendship and many other comforts of life that are now denied us on account of bad roads.

Due to the advantages numerated above and many others brought about by good roads, it behooves us to closely apply our best effort and thought to this important subject and bring forth a plan that will provide roads of the greatest use and service to the nation, state and county.

It appears from studies made that the total mileage of unimproved roads in the United States is approximately 2,500,000. From 2 to 4% of this mileage should be classified as national highways under federal control; 10 to 15% as state highways under state control; 10 to 15% as improved county highways, and the balance, some 70%, would necessarily have to continue earth or top-soil roads under county control. This would give a general plan of roads controlled by the Federal Government, the states and the counties. It is also believed advisable and desirable that the nation should assist the states by aiding them with federal aid and the states the counties with state aid, until plans have been perfected and a well established and efficient organization has been set up for each unit. This would give a national system of approximately 60,000 mi., state systems of 250,000 mi. and improved county systems of 300,000 mi., and about 1,800,000 mi. of earth or top-soil roads completing the county systems. The cost of the federal system would be about $2,000,000,000; the state systems $6,000,000,000; the county improved systems $6,000,000,000, and the county earth and top-soil roads about $3,000,000,000, making a grand total of $17,000,000,000 that would be necessary for the people of this country to expend in road improvements in the next ten to twenty years. This will appear to many to be an enormous sum, but when you consider that there is available today approximately $1,000,000,000 for road construction —and from all indications this amount will be exceeded in the near future—the possibility of accomplishing this plan in ten or twenty years is conservative, to say the least. The speaker believes that when once started and under way, the benefit to the general public will be so apparent that the work will be speeded up and completed much earlier than we believe possible today.

How will this plan in a general way apply to North Carolina, and what will it mean to your state?

There are in the state approximately 50,000 mi. of unimproved roads. The mileage, in my judgment, selected for a national system would consist of from 1,200 to 1,500 mi. and the mileage comprising the state system from 5,000 to 6,000 mi., and the improved county systems, about 6,000 mi., leaving 36,000 mi. of county earth and top-soil roads to be maintained as such.

The mileage in the national system would give two trunk line highways lengthwise and two crosswise of the state. The state mileage would give 10 lines lengthwise and 10 lines crosswise—or a better distribution would be 24 lines crosswise and 4 lines lengthwise. The state highways plus the national highways would form a system of trunk highways 18 mi. apart, lengthwise and crosswise of the state, making every house within 9 mi. of a state or national highway and at least 90% adjacent to or a short distance therefrom. The improved county systems would supplement this and bring every house on or within 4½ mi. of an improved road. This would checkerboard your state with improved roads. But we all know that there are certain sections demanding a greater development of their highways than others, and the checkerboard system is not the best or most advantageous to take care of the densest traffic. Those roads must be selected for improvement that will be used the most and be of the greatest service to the public.

The national system should connect the most important points within the state, but should be laid out with a view of expediting interstate traffic and should not take into consideration state lines, the object being to serve the entire country as a whole, in the best and most advantageous way, keeping in mind the economic, social and military value of such highways from a national standpoint.

The state system should connect the county seats and important points not connected by national highways, coordinate and connect with the national system so as to serve intra-state traffic requirements regardless of county lines.

The improved county system should be developed in zones, building out from the centers of population and railroad stations like the spokes of a wheel, connecting and coordinating with the national and state systems so as to make the transportation of products from the farms to the markets cheaper and easier.

The large percentage of earth roads remaining should be graded and drained and properly maintained.

Some will say this is but a dream of a dreamer, but, thank God, there are some men and women who see visions in their dreams and are not always dead asleep and snoring. Back when the world was young the salvation of all was preserved by men of vision and they have given for our guidance, such admonitions as: "Where there is no vision the people perish," and "That whereupon, Oh King Agrippa, I was not disobedient to the heavenly vision."

If it had not been for the men and women of vision who had the courage to put their visions into practical use we would not be the people we are today. To make any plan effective it must have the cooperation and support of all. or, at least, it must have enough merit to recommend itself to the public and inspire a greater effort on the part of those who have seen the vision and are working for its realization.

If you believe that it is for the best interest of the country to have an effective and complete plan of highways, then the plan outlined should have your most earnest thought. It should be strengthened or modified so as to meet the varying conditions of which you are familiar, and your cooperation is essential to its success. Don't be a kicker and a knocker just because the small details do not meet your ideas, but if the essentials and fundamentals are sufficient to be effective then you should get behind the plan and back it with all your might.

The bulk of the road mileage to be constructed in this country will have to be built by the states and counties, the Federal Government improving only a very small mileage of main trunk lines. It is, therefore, important that a plan be laid out as soon as possible coordinating the units in a general plan. Every county in the United States should formulate a plan of roads to be constructed and maintained along definite lines and spend its money in a systematic way in carrying out this plan.

Much road work is being done in the counties without a well defined plan, and money is being wasted in working under such conditions. It is not necessary for me to lay stress on the necessity of the closest cooperation between the different units, for I see in this audience many who have labored long in bringing about such results. There are some who believe that the national system will interfere with the state highway departments' work and the prestige of the departments will be hurt. The same arguments were made by the counties when the state highway departments were formed, but we see the counties forging ahead, issuing bonds and expending more money than ever before. The state highway departments have a large task before them and they need not fear any activities of the Federal Government, for such activities will strengthen their positions and add to their prestige.

Those who are working for a national system want your advice, help, and cooperation. If you believe it is right and proper to build better highways and that great good will come from their construction, then it is your duty to write to your members of Congress, telling them that you have carefully gone into the need for a national system of highways and that you believe the best interest of the country will be served by the passage of legislation to bring about this result. Your senators and congressman want to hear from you on this important question and to know your views.

Without the proper study of this big problem, it is impossible to know its far reaching benefits and I want to read you a few excerpts from a letter written by a highway official, in which he has jumped at conclusions and allowed his sectional prejudice to warp his judgment beyond all reason. He writes as follows:

> Of course, you understand that I am opposed to this propaganda and shall do all in my power to defeat the passage of the Townsend Bill, as it is an absolute detriment, as I see it, to our work in this state. The bill is absolutely in the interests of the South and the far West. The East and Central or Middle West pay the bulk of federal taxes, and under this bill will construct two main highways through the entire length of the southern and western states.
>
> I was at ———— when the Transport Convoy passed through that city on its way to the Pacific Coast. The entire proposition of moving this Transport Convoy across the continent is in the interest solely of the Townsend Bill, and the taxpayers are footing the expense of a propaganda which should be carried on in a different way.

The Townsend Bill is in the interest of all the people regardless of state lines and does not favor any one section over the other. The man who tries to raise sectional feeling and hatred is out of harmony with the times and is not 100% pure American.

My attention was attracted to an advertisement appearing on the back outside page of the "Southern Churchman," August 9th issue. It presented a picture showing a church in the distance, a very muddy and rocky road with a horse laboring to pull a buggy through the mud; the fences were falling down and a dilapidated barn stood nearby. Above the picture was this quotation, "To inform the mind and awaken the conscience." Below: "Poor roads, poor churches.

"Fertile land and good roads mean healthy, growing churches; poor farming and bad roads mean spiritual as well as material decay.

"A few miles of rocky, rutty road separate the farmer from contact with his fellows.

"A few short miles keep him away from new ideas, new thoughts, new methods; a few short miles of bad road can almost destroy the social spirit which is the very essence of religion.

"Separating the farmer from his markets and his people, and almost divorcing him from his church, most emphatically the problem of better roads is a problem in applied Christianity."

Highway Maintenance in Wisconsin—VII*

Gang Maintenance Continued—Surface Treatment of Stone and Gravel Macadam Roads—Preparation of Surface—Application of Bitumen—Treatment of Bituminous Macadam—Concrete Roads

Holes.—The holes in the road surface should be filled by one of the methods described under patrol maintenance.

Sweeping Surface.—Sweep the surface of the road with a power sweeper until all dust is entirely removed from the stone surface, and remove the accumulations of dirt and vegetable matter from along the edges of the stone surface with the light grader. If there be any spots of vegetable matter remaining on the surface, remove them by the use of a hand broom or shovel. Be sure to have the surface clean before starting your oiler for if there be any spots not thoroughly cleaned, the oil will not penetrate to the road metal, leaving a blanket of dirt between the oil and the stone which will eventually pit out, causing very disagreeable holes in the road surface.

Distributor.—Use a pressure distributor and have power enough before it to move along at a speed that will develop the necessary pressure to insure an even distribution of the oil. A motor truck supplies the best power for the majority of distributors, but good results may be obtained with four horses. A few counties have purchased motor oilers which are very satisfactory. Others have mounted a tank and distributor on a motor truck, resulting in equally good work.

Bitumen.—Use a bitumen that can be applied easily without heating. It is much more convenient, less expensive, and gives equally good results.

Amount.—The amount required will vary with the condition of the surface. A new road will require a full half gallon to the square yard, and possibly more, while a road that has been previously treated will require less than that amount. There are more failures from using not enough bitumen than from using too much.

Method.—It is best to apply ¼ gal. of bitumen at the first application, allowing 24 hours for penetration before the second application. Following the second application of bitumen for the first surface treatment, an absorbent covering of sharp, clean torpedo sand or stone chips not to exceed ½ in. in size should be applied. This will absorb all excess bitumen, fill the holes in the road surface, and form a carpet which will protect the stone surface from wear and displacement.

The best method of applying the sand or stone chips is to deposit them in small piles along the shoulders of the road and apply by hand with a square pointed shovel, as required. In many instances it is impractical to deposit the absorbent along the roadside. In this event the material is spread by hand from a motor truck or wagon. One cubic yard will cover properly about 120 sq. yd, of surface.

Keep travel off the surface for at least 48 hours after the absorbent is applied.

Each succeeding surface treatment will require a little less bitumen and an increase in the size of stone chips used, until in the fourth or fifth year stone from 1 in. to 1½ in. in size may be used. As the material used is increased in size, it should be well rolled into the surface and will soon form a new wearing surface.

It is very important that surface treatments be applied early in the season. The months of May and June are the proper time.

Counties requiring the use of several cars of bitumen annually are constructing one or more concrete oil storage tanks. The cost of a 36,000-gal. tank is approximately

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*From "Highway Maintenance," Bulletin No. 8, Wisconsin Highway Commission, a publication devoted especially to patrol maintenance on the state highway system, compiled by J. T. Donaghey, Maintenance Engineer.

$1,000. Plans for construction of these tanks will be furnished by the commission upon application.

Where this method of surface treatment is followed, a macadam road should have a better wearing surface at the end of almost any period of years than when first built, except under extremely heavy traffic conditions.

Bituminous Macadam

Bituminous macadam requires practically the same method of surface treatment as is described under surface treatment of water-bound macadam, the only difference being that a bituminous macadam surface does not need surface treatment as early in its life or as frequently as a water-bound macadam. However, it should be surface treated once every two or three years and if good bituminous material and clean hard stone chips are used, the surface treatment will build up the wearing surface and the road should remain as good as, if not better than, when originally built.

Concrete

Crew.—It is economy to have a small maintenance crew go over all the concrete roads in the county once or twice each year. Such a crew consists of a foreman, one team hauling the material, and four laborers, equipped with a tar heating kettle. This crew covers, under average conditions, all the joints, cracks, and small pits in from 1 to 2 mi. of 16 or 18-ft. road in one day at a cost of from $25 to $75 per mile for labor and materials. The tools used consist of a wheelbarrow, two fiber street brooms, two wire brooms, a couple of shovels, and a pouring pot having a round spout.

Cracks and Joints.—Two men are utilized to sweep all cracks clean, with the wire brooms, after which a man with a pouring pot fills the cracks with a special "Tarvia X" which is heated to about 225° F. An excess of tar is poured in so that it extends an inch or so beyond the edge of the crack. It is then allowed to stand in the crack for a few minutes to prevent it from "bubbling" out in case the sand is wet. The sand, which should be dry and coarse, is spread with a shovel over the crack and into the tar, and the whole is left for traffic to iron out.

The excess of tar and sand is worn away rapidly, leaving a smooth even surface. This method of repair prevents the edges of the concrete from spalling and chipping, and no water can get through to the subgrade to freeze and heave the concrete. The work is done preferably in dry hot weather and as early in the season as the weather will permit.

Depressions and Holes.—In case small depressions occur, the time to repair them is when they appear. The best method of repair is as follows:

The surface is first swept with a steel broom to loosen the dirt; after this, the spot is thoroughly swept with fiber street brooms. To remove the fine dust which the steel brooms leave behind, ordinary house brooms are used, which leave the surface fairly clean. The depression is then covered with hot "Tarvia X"; then with coarse sand or screenings, and opened to traffic. In case the depression is of considerable depth, or what might be called a hole, one of two methods is advisable:

First (in case you want to avoid delaying traffic), clean the depression as already described and then paint it with tar, upon which bring the hole to grade with crushed stone, being carful not to have the stone as large in size as the depth of the depression. Tamp the stone in place with hand-tampers or roll with a roller, if one is available, and fill the voids with a heavy bituminous road binder, allowing about ¾ gal. per square yard per inch in depth. Cover the surface with torpedo sand or stone chips.

The second method is to cut the poor place out entirely and after trimming the hole and thoroughly sprinkling the sides, fill with the same mixture as was used in the original road. After pouring the concrete, treat the same as in reconstruction.

Small defects due to balls of clay, sticks or coal getting into the aggregate may be best repaired as described for shallow depressions. The same is true of battered joints or cracks that may appear.

Federal Highway Council Succeeds Highways Transport Committee

The Highways Transport Committee of the Council of National Defense has been succeeded by the Federal Highway Council, according to a recent announcement from that organization. This step was taken as a result of the decision to disband the Highways Transport Committee.

According to the announcement, the work of the Highways Transport Committee will be carried on under the supervision of Charles W. Reid, as manager of the Transport Bureau of the Federal Highway Council. Mr. Reid has been chief executive officer of the Highways Transport Committee since it was reorganized a few months ago.

Texas Road Bond Issues

Amount of Issues Approved During Fiscal Year Just Ended Nearly Double the Amount Approved During the Two Preceding Years

Road bond issues amounting to $26,828,550 were approved by the Attorney General of Texas during the fiscal year ending August 31, according to a tabulation recently completed.

This, it is stated, is almost double the amount of the bonds issued during the two preceding years and is more than half of the total amount of all bonds issued in the state during the fiscal year just ended. It is estimated that in addition to the road bonds already voted, $30,000,000 in bonds have been voted since the beginning of the present year or will be voted in the near future.

These bonds have been issued by counties and districts, but on November 4 the people of the state will vote upon a constitutional amendment authorizing a state road bond issue of $75,000,000.

University of Michigan Fellowships

Two Fellowships in Highway Engineering Renewed After Suspension During the War

Two fellowships in highway engineering at the University of Michigan will be awarded early in October. Both of them are fellowships that were established prior to the war and have been suspended.

The Detroit Edison Fellowship, given by the Detroit Edison Co., pays the holder $500 annually, with an allowance of $100 for expenses. It is to be continued for the years 1919-20 and 1920-21. It is to be used for the investigation of the subject of moderate cost country roads.

The R. D. Chapin Fellowship, given by R. D. Chapin, President of the Hudson Motor Car Co., also pays the holder $500 annually, with an allowance of $100 for expenses. It is avaibable for the year 1919-20, and is to be devoted to the study of hard-surfaced roads and pavements.

Candidates may apply for these fellowships until October 10. The requirements are a bachelor's degree in civil engineering from a college of recognized standing, enrollment as a candidate for the degree of master of science in engineering and residence at the University for eight months.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIII **September 24, 1919** No. 13

THE NEED OF HIGHWAY CLASSIFICATION

It seems to be generally believed that there is real need of national roads—that is to say, interstate highways laid out with a view to accommodating the rapidly growing traffic between more or less widely separated points in different states. And since federal aid in the construction of roads is an accomplished fact, it is logical that such aid should be applied to the building of interstate roads instead of being utilized for the construction of roads that meet merely local needs.

Under the present federal aid laws, the selection of the roads to be improved partly with funds from the national treasury lies primarily with the state highway authorities. While the Bureau of Public Roads passes upon all projects, it has little choice but to approve those which comply with the not very strict requirements of the law. The result is that a considerable portion of the federal money is being used for local benefit only. A proper classification of the country's roads, followed by action that would insure the expenditure of federal funds upon those roads included in a national highway system would be of great benefit to the nation.

One of the best arguments for a national highway system is a comparison of present conditions with those of not so many years ago when the states first began to participate in road work. Up to that time all highway work had been done by the local administrative units—counties, townships, road districts and the like. So long as traffic was local, local roads sufficed. But when travel became a statewide matter, the need for state highway systems became apparent. The result was the almost universal adoption of the state aid principle and the construction of state trunk lines that answered every purpose while traffic remained a matter of intra-state hauling.

Now, however, we are confronted with conditions that are exactly analogous to those that had to be met when traffic began to demand more than township and county roads. President day traffic is largely interstate in character. It needs routes that are continuous across state lines—roads leading from state to state, perhaps across intervening commonwealths. And just as cooperation between townships and between counties was not sufficient to provide state-wide systems, so cooperation between different states has been unable to bring about the construction of interstate routes making up a national system.

The solution of the difficulty would seem to be the passage of federal laws providing for the classification of the highways, as urged in a paper printed on other pages, and the laying out of a national system by federal action.

THE ELEVENTH GOOD ROADS SHOW

After two annual conventions with only "parlor exhibits," so to speak, the American Road Builders' Association, we understand, is planning to make the Eleventh Good Roads Show at Louisville, Ky., next February, not only an exhibition comparable with those held in Pittsburgh and Boston in 1916 and 1917, but one that will surpass any of the former shows both in number and variety of exhibits.

As has been noted in previous issues, the show will be held in conjunction with the Association's seventeenth annual convention, on February 9, 10, 11, 12 and 13. The First Regiment Armory, with over 50,000 sq. ft. of clear floor space, has been secured for the display, and the preliminary work of dividing and apportioning the space has been commenced.

There seems to be ample justification for the expectation of the officials of the Association that the 1919 exhibition will break all previous records, for there has never been a time in the history of the country when road building occupied the place in the public mind that it does today. During the past two seasons work has been materially curtailed, especially on new projects depending upon bond issues for their financing. As soon as the war-time restrictions upon road building were removed, activity was renewed and immediate steps were taken to inaugurate extensive programs of improvement. During the season just drawing to a close a great amount of new work has been undertaken and unprecedented appropriations have been made for future work. In addition to setting aside unusually large sums from current revenues, several states have voted large bond issues and more are to be acted upon within the next few weeks. Unusually large—in many cases record-breaking—bond issues have been made by counties and other subdivisions.

All this activity calls for road building machinery and materials in amounts greater than have ever been required before. State, county, township and city highway officials and contractors are in the market for machinery to take care of this immense volume of work and to meet the conditions imposed by the scarcity and high cost of common labor. The manufacturers and dealers are aware of these conditions and may be counted upon not to neglect the advantage of displaying their products at the Louisville show, for they know that the A. R. B. A. conventions bring together more of the real road builders than are ever gathered in one place for any other purpose.

The Road Builders have an exceptional opportunity to do a real service to road officials, engineers and contractors on the one hand and to machinery and material manufacturers and dealers on the other, and there is every reason to expect that they will make the most of it.

New York State Road Builders' Association

OFFICERS

JOHN H. GORDON, President	Albany
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Crusher Run

As a result of a request made by a delegation from Middleburg, which called on State Highway Commissioner Greene, he has had plans prepared calling for a 16-ft. reinforced concrete road from Middleburg to Franklinton, a distance of 5.6 mi. The proposed road is on the line of the old stage coach route between the Susquehanna Valley and the Catskills, one of the most heavily traveled roads in the county.

A delegation from Chemung County also petitioned Commissioner Greene for a state highway which will connect the village of Southport with the Pennsylvania state line, a distance of 4½ mi. Plans will be prepared immediately.

In accordance with the plans of Commissioner Greene, a bill will be introduced in the next Legislature providing for a change in the plans of the Storm King Highway between Cornwall and West Point so that an 18-ft. concrete road may be constructed instead of a 16-ft. macadam road. Commissioner Greene says the road will be the most expensive ever constructed in this country.

S. Shibata, of Tokio, who is in America to study road construction for the Japanese Government, was a visitor at the Highway Department recently. His object was to seek information in regard to the highway system in New York State. During his conversation with the Commissioner he commended New York State's marvelous highways.

An amendment to the state highway law which took effect on September 1, 1919, requires all trucks on country highways to be equipped with mirrors.

At the opening of the next Legislature Commissioner Greene will ask for the passage of an act submitting to the voters a proposition for a bond issue of $100,000,000 for new highways and for the improvement of existing highways. The Commissioner's idea is that it is better to go to the people once for a large bond issue than to go to them from time to time for several small ones. This does not mean that all this money is to be raised immediately, for it could not be spent immediately. As with former referendums, the money to be spent must be appropriated by the Legislature from time to time as needed, and when it can be wisely spent.

A bond for $453,000 has been filed with Commissioner Greene to guarantee the complete construction of the Storm King Mountain Highway between Newburgh and West Point. The John L. Hayes Company has the contract, which must be finished in 1922.

The Coeymans-Indian Field Road is well under way and contractor James P. Kelly expects to have it completed this year.

Work on the road connecting Guilderland with the Schenectady County line is progressing very rapidly, and the contractors, Brown, Lowe & Parker, are rushing it towards completion.

Contractor Samuel Rosoff, who has the contract for building the Tupper-Long Lake Road in the Adirondacks, reports that with favorable weather he will have the job completed in a few months.

Both contracts of the S. B. Van Wagenen Co., the repair job in Ulster County and the construction one in Dutchess County, will soon spell "finis." Good weather and efficiency have contributed towards this good work.

The repair contract of the Kent Construction Co., Delaware County, is another job well under way. This month's estimate was $12,466.84.

The following also received high estimates this month: S. B. Van Wagenen, Inc.; J. P. Dugan & Co., Inc.; Chenango Construction Co., Greenfield Construction Co., Nathan E. Young, Paddelford & King and De Graffe & Hogeboom.

Commissioner Greene was the guest of honor at a banquet given by the Oswegatchie Trail Association, composed of men from all sections of northern New York who are interested in the improvement of the road between Carthage and Tupper Lake through the heart of the Adirondack region. Commissioner Greene in his talk said that the strongest argument for the road was the fact that it would enable the state to rush men into the Adirondacks to extinguish fire in that region.

At the letting which took place at the Highway Department on August 26, the largest contract was awarded to McArthur Bros., New York City. This was for the Schuylerville-Gansvoort concrete highway in Saratoga County for $331,866.

The Board of Supervisors of Cayuga County put in a bid for the two roads in that county, and the contracts were let accordingly. The county will have the work done under state contract, which is an unusual procedure in state highway work.

Two bids were received on the Oakwood Avenue, Rensselaer County Road, and as both were above the engineer's estimate they were rejected. The bidders were Campbell & Wall and the Troy Contracting Co., both of Troy, N. Y.

The Conesus-Wayland, Livingstone County Road, was bid upon by the Atlantic Construction Co., Atlanta, N. Y., for $221,117.50. This bid was also rejected as being over the engineer's estimate.

Three members of the New York State Road Builders' Association were awarded contracts at the August 26 letting. W. T. Thayer Company received the Malone-Chateaugay, Franklin County job, for $67,538.06; Nathan E. Young, the repair contract, Cincinnatus, Cortland County, for $12,982, and Wm. G. Fox, the Cambridge-Ash Grove, Washington County contract, for $9,836.80.

The following members were awarded contracts at the letting which took place on September 9: Jos. Walker, the Claverack-Chatham Road in Columbia County, for $124,229.28; De Graffe & Hogeboom, Inc., the Colchester-Delancey Road in Delaware County, for $44,742.25; The Greenfield Construction Co., Marilla-Marilla Station, Erie County, for $23,194.75; Rosoff Engineering Co., Eagle Bay-Sixth Lake, Hamilton County, for $52,036.45; Richard Hopkins, Morris-Oneonta, Otsega County, for $228,988.00

The State Department Bowling League has organized and will open its bowling season on Sept. 24 with fourteen teams. John Harrington, of the State Highway Department, is one of the members of the governing board.

Senior Assistant Engineer E. V. R. Payne, of the State Engineer's Department, has just received the citation awarded him by General Pershing on April 19, when he was serving as a lieutenant colonel in the 25th Engineers in France. The citation is for distinguished service.

The new plans for the state highway bridge which will span Rondout Creek at Kingston have been approved by Commissioner Greene. The plans have been forwarded to Secretary of War Baker for his approval. This approval is necessary because the bridge will span a navigable stream. Plans will not be made public until they have been passed upon by Secretary Baker.

New Hampshire Good Roads Association

OFFICERS FOR 1919

FREDERIC E. EVERETT, President	Concord
WINFIELD M. CHAPLIN, First Vice President	Keene
HARRY L. SMITH, Second Vice President	Lakeport
W. B. HOWE, Secretary and Treasurer	Concord

Board of Directors

O. F. WINSLOW	Nashua
C. M. BROOKS	Keene
H. W. SPAULDING	Manchester
ALFRED CLARK	Concord

The quartely meeting of the New Hampshire Good Roads Association was held at Berlin, N. H., on Thursday, Sept. 11. The meeting was called to order at 11 a. m. with State Highway Commissioner F. E. Everett in the chair. Fifty applications were received and accepted for membership. Most of the applicants were from Berlin, which showed that the people in that section are interested in good roads.

Maj. Eli J. King, of Berlin, delivered a very good address of welcome to the New Hampshire Good Roads Association and guests, and informed them that during their stay, whether it lasted during Thursday or longer, they would find the key to the city at the Mayor's office. Mr. Everett responded in behalf of the Association.

The meeting was somewhat different from previous meetings. The majority of the time at City Hall was taken up with interesting papers followed by discussions. Charles A. French, City Engineer of Laconia, read a very interesting paper on bituminous macadam construction and maintenance, followed by a discussion between the Chair and members. Mr. French is an old time believer in bituminous macadam, and his paper was very interesting.

Fred Coburn, assistant to State Highway Commissioner Everett, followed Mr. French with a paper on the construction and maintenance of gravel roads. Mr. Coburn spent two years at Durham College studying the geology of New Hampshire, and his paper was greatly appreciated, as shown by the discussion that followed between the members of the Association from the northern part of the state, especially through the Notches, where nothing but gravel roads are to be found.

The question of dragging the roads after and during rainstorms was thoroughly discussed, and it was decided that in most cases the best results were obtained where the gravel roads were dragged as soon as possible after a rain.

Mr. Chapman, of Keene, N. H., read a paper on the maintenance of dirt roads. Mr. Chapman is in charge of the Keene section, and his paper received close attention.

Mr. Crocker, of Fitzwilliam, who journeyed to Concord last winter, endeavored to convince the members that the hardpan roads in the Keene section certainly needed closer attention.

The meeting was adjourned at 1:30 p. m. and the party left in automobiles for the Brown Farm, 3 mi. outside of the city of Berlin, where the members and guests were entertained with the real New Hampshire hospitality. The city band of 24 pieces furnished music. Mr. Sullivan of Berlin rendered solos and then a light lunch was served. Previous to this there was a ball game between the men from the northern section of the state and the southern section, in which the members from the south were victorious—the score was 5 to 4. Our worthy secretary, Will Howe, officiated as umpire. Considering his decisions, the spectators and players showed great self-restraint.

There was also an eight-round boxing match between Young King and Battling Coyle, both Berlin boys, and formerly of the Y D. The referee was Mr. Wildes, of Berlin, formerly of the Y D. A collection was taken up for the boxers, with the understanding that the winner would receive 60% and the loser 40%, but the general opinion of the meeting seemed to favor a draw, and the purse was divided on a 50-50 basis.

Following the boxing bout, the members of the Board of Public Works, City of Berlin, came forward with a real shore dinner, consisting of steamed clams, lobsters and all the trimmings, including punch and cigars.

At 6:30 p. m. Chairman Everett and Harry Smith, of Lakeport, and Secretary Will Howe, called the Association together and passed a resolution thanking the Mayor of Berlin and the Board of Public Works for the hospitality shown the members of the New Hampshire Good Roads Association during their stay.

In the evening several of the members remained and enjoyed another session with Mayor King, the members of the City Government and Mr. Furness, Superintendent of Streets.

Too much praise cannot be given the Mayor and city officials for the manner in which they entertained the Association on its first visit to the northern part of the state. From 11 a. m. to 11 p. m. there was something doing every minute, and the members hope that the entertainment committee of the Association will decide to go to Berlin on one of their meetings next year.

Following the meeting, Commissioner Everett, Messrs. Coburn, Howe and French left for an inspection tour through the north end of the state by the way of Colebrook.

Notes of the Meeting

What Happened to Bostwick?

Some member got confused on the dates and effectively disposed of Mr. Rogers' straw hat.

Commissioner Everett is still able to demonstrate that he is in Freddy Parent's class as a ball player.

Will Howe refuses flatly to umpire any other ball game for the New Hampshire Good Roads Association.

It was a holiday for most of the men in the Street Department of the City of Berlin, there being some 25 or 30 of them at the meeting acting as cooks, waiters and K. P.'s.

The principal feature of the ball game was the batting of Coburn for the team from the south and Furness for the team from the north, and the umpiring of Will Howe.

The city of Laconia, under the supervision of City Engineer Charles A. French, is constructing a section of the trunk line of the White Mountain Route between Laconia and the Weirs. The construction is to be of a bituminous macadam with 6 in. of stone, and the bitumen is being poured by hand. It has been Mr. French's experience that this work can be done by the hand-pouring method cheaper than by any other, due to the fact that they are so far from distributing points of the various material concerns that it is impracticable to send motor distributors.

The continued heavy rain has done considerable damage to the gravel roads through the northern sections of the state, but by following Mr. Coburn's instructions, as read in his paper at the meeting, the roads can be put back in first-class condition at a moderate cost. In some of the districts the patrolmen have been working their drags during the rain and have kept their roads in fairly good condition, especially through North Woodstock and Campton.

The State Highway Department is doing bituminous macadam construction between Dover and Rochester.

The City of Rochester is reconstructing a large section of Rochester Square, using asphalt mix.

The State Highway Department is resurfacing a section of the trunk line in the town of Merrimac. This is being done by the Winslow & Cummings Construction Co., and our former president, Mr. O. F. Winslow, of Nashua, has charge of the work.

Commissioner Everett reports that with the aid of the Government trucks recently received from the Federal Government, he is able to complete his work much faster than by the old horse-drawn vehicle method.

Federal aid construction work is going on in the following towns: Hampton, North Hampton, Portsmouth-Rye, Project No. 37 A & B; in the town of Sunapee, Project No. 8; in Merrimac, No. 23; Hinsdale and Winchester, Nos. 50 and 51; East Kingston, No. 46; Milford, No. 38; Fitzwilliam, No. 59, and in the town of Walpole, Project No. 48.

Bridges are being constructed under Federal Aid in the following towns: Walpole, Farmington, Moultonboro and Epping.

Federal aid work is also being done on force account basis in the following towns: Alexandria, No. 20; Alton, No. 4; Andover, No. 25; Barrinton, No. 5; Bradford, No. 29; Canaan-Enfield, Project No. 13; Colebrook, No. 14; Danbury-Grafton, No. 7; Dublin, No. 19; Epsom, No. 15; Franklin, No. 22; Haverhill, No. 53; Hill, No. 20; Keene, No. 36; Kingston, No. 63; Lebanon, No. 58; Londonderry, Nos. 12 and 64; Marlboro, No. 2; New London, No. 26; Northwood, No. 5; Nottingham, No. 5 and Peterboro, Nos. 18 and 77.

The labor organizations of the state are making strenuous efforts to secure the passage of bills favorable to labor. One bill provides for a uniform and compulsory 48-hour week throughout the state. Another bill defines the rights of trade unions in disputes that may arise between employer and employed.

The American Federation of Labor has increased its membership considerably during the past three years, and it is estimated that there are 35,000 members, or even more, in New Hampshire.

Construction has been started on the new state highway known as the Franklin Line between Lebanon and Enfield. When completed, this road will carry traffic over the hill, instead of across the Shaker Bridge which crosses Mascomahake near the Shaker Settlement. This bridge is dangerous to cross at all times and at certain seasons is impassable.

In the near future Manchester proposes to expend nearly $1,500,000 on the following projects: New high school, $325,000; new West Side school, $225,000; new Franklin St. school, $140,000; new South End Bridge, $400,000; new Amoskeag Bridge, $270,000; Town of Londonderry, $500; Fire Department loan, $6,000; sewerage survey, $15,000; McCrillis Settlement, $5,000.

The question of doing away with the toll gates on the wooden bridge over the Hampton River is again being agitated. The automobile traffic over this bridge has been heavier than ever before and serious inconvenience is caused by the stopping of every car to collect the toll.

William C. Riordan a former employee of the city of Manchester, has brought suit against the city to recover damages to the amount of $15,000. Riordan alleges that he has lost the use of his left arm as the result of his being run into by a city truck, while standing on the running board of another truck, also owned by the city. It is claimed that the accident happened on March 11, 1916.

Massachusetts Highway Association

OFFICERS FOR 1919

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JOHN M. McCARTHY, Secretary	15 Ashburton Place, Boston
CHARLES A. BROWN, Treasurer	Wellesley

Vice Presidents

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HENRY V. MACKSEY	Woburn

Directors

JOHN A. GAFFEY	Medford
HENRY A. SPATES	Winchester
CHARLES J. BENNETT	Hartford, Conn.
RICHARD A. JONES	Waltham

Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston.

News and Gossip

During the recent riots in Boston it was a good thing for the property owners and the volunteer police that the paving blocks are set with pitch and cement, for being unable to utilize the paving stones, the mob was short of ammunition. However, the need was supplied unintentionally on at least two occasions. A farmer drove near the principal point of disturbance in Scollay Square with a wagon load of crab applies. These were quickly seized by the crowd and used for missiles, but the real provider of ammunition was the man who later tried to drive through the mob with a load of coal. This he lost in short order, and for a while the air was full of flying pieces of coal.

The Massachusetts Highway Commission has just let the largest single contract for highway work in its history. The road is to be of cement concrete. It will total 5⅛ mi. and the lowest bid was $253,808.13, submitted by Coleman Brothers, of Boston, who were awarded the contract. The next lowest bidder was J. W. Duff, Inc., of Newton, who offered to do the work for $281,719.50. The highest bid was $362,549.10. The approximate cost is $50,700 per mi., and under the Federal Aid law the U. S. Government will contribute $20,000 for each mile constructed. Work is to be started as soon as possible, and it is expected that the road will be finished by next fall.

The highway will form a connecting link between Greenfield and Shelburne, and will take the place of the crooked and narrow rough road now existing. The maximum grade will be 6% and the new route will increase the distance between Greenfield and Shelburne by 1½ mi. The highest elevation of the new trunk line will be about 800 ft. above sea level, but the grades are so easy that the motorist hardly realizes the ascent to such a height. One interesting feature of the work is that the present roadway can be used during practically all of the construction period.

A delegation of Boston city employees, members of the Municipal Clerks' Union with an A. F. of L. charter, recently called upon Mayor Peters to ask for an immediate revision of their payrolls. The request of the union will mean salary increases of $125,000 from Sept. 1 to the end of the year, and $300,000 annually thereafter. Mayor Peters has referred the request and all data submitted to the Finance Commission, and has asked that board to make a study of each department with a view to equalizing all salaries.

There is much interest in the final make-up of the State Department of Public Works, which in November supersedes the present Highway Commission and the Commission of Waterways and Public Lands. As now constituted, each of these boards is composed of three members, as follows: Highways: Wm. D. Sohier, Chairman; Frank D. Kemp and James W. Synan. The other board members are John N. Cole, Chairman; Wm. S. McNary and Jesse Baxter.

Under the new arrangement there are places for only five commissioners, one chairman and four associates. The chief of the department is to be appointed for three years, and the associates will be nominated on the first appointment for one and two year terms, and at the expiration of these terms future appointments will be for three year terms.

The chairman will receive not more than $7,000 per annum, and the associates not more than $6,000.

No intimation has been given out as to who will be appointed by the Governor, but if he elevates any one of the present members of either of the two boards, there will be a chance for all six of the men who now constitute the existing commissions. It would work out this way: Of the six men, one would be chairman, four could be appointed as associates, and the sixth man could be given the position as registrar of motor vehicles. The Massachusetts motorists, who are now paying the state a total of $2,500,000 in license fees, are interested in seeing that the greater part of this sum is spent on highways as the law provides, and the section of the law that they object to provides that the registrar is to be appointed by the chief of the Public Works Department and not by the Governor. It is expected that the various automobile organizations may write to the Governor offering their views on the matter, not with any effort to influence his opinion to their benefit, but simply to present to him their views, which are based on long experience and constant contact with the state officials under the existing conditions. This information, tactfully presented, might be of considerable assistance to the Governor. Letters of the same sort might well be addressed to the Governor by the Massachusetts Highway Association and other road organizations of the state, if they have any suggestion that would be of assistance to him in reaching his decisions regarding highway matters.

Samuel Hobbs, for many years resident engineer for the State Highway Department in Mr. Pillsbury's division, has resigned to accept a position as chief engineer for the Rowe Contracting Co. Mr. Hobbs is a graduate of Dartmouth College, and during his long service with the highway Commission has had charge of many of the important road contracts in his section. Mr. Rowe is fortunate in securing the services of such a popular and capable engineer.

Mayor Breath, of Chelsea, recommended to the Board of Aldermen that the pay of city laborers be increased from $3.25 to $3.75 per day. The aldermen passed the necessary motion, and the new rate was effective at once. The pay of women clerks in the City Hall was increased and standardized. Hereafter the minimum rate will be $14 a week.

with increases until $18 has been reached, this being the maximum rate for this class of employees.

As an example of what results from short hours and increased pay, note what one contractor has to say:

He claims that when wages were $2 per day, two men would make an ordinary sewer connection in one day, at a total labor cost of $4. Now that the men receive $5 per day, it takes two men two days to do the same work, bringing the labor cost to $20.

Mayor Haines, of Medford, has vetoed an order of the Board of Aldermen levying a street watering and oiling assessment of 3½ ct. per linear foot on the land on streets which have been watered or oiled this year. The Mayor claims that the reduction from last year's rate, which was 5 ct. per linear foot, is too much, and the total amount of the assessment, $16,702, will not pay expenses for doing the work.

The Selectmen of Wakefield have voted to grant an increase of 50 ct. per day to all town laborers, making the total pay $4 per day. The men asked for $4.50, but have accepted the new rate.

Metropolitan Park employees have voted to demand a raise of 20% for all laborers and mechanics. The union also demands the abolition of the present system of paying their wages by check. It also protests that the 8-hour law is not being lived up to. It is claimed that stablemen have been working long hours and then have received time off to make up for the over-time.

The union also requests the abolition of the present prepayment pension system and insists on the payment of pensions without assessing the cost on the men.

Mayor Peters has recently received a voluminous report from the Finance Commission which charges that the city of Boston has purchased some 400,000 gal. of non-asphaltic road oil from an oil broker without complying with the requirements as to competitive bidding. The report, which appears in full in a recent issue of the City Record, would cover several pages of this magazine, and it cannot, therefore, be reprinted.

At about the time this matter was brought up the Police Department went on a strike, and the Mayor has certainly not had time as yet to reply to the criticism.

Mr. Michael Driscoll, of Brookline, has recently returned from his annual vacation visit to Sharon Springs, N. Y.

This column would like to secure a complete record of all the members of the Massachusetts Highway Association who took part in the world war. If the soldiers and sailors are too modest to send in their names, will their friends do it for them?

Some Massachusetts Tax Rates for 1919

	1919	Increase over 1918
Salem	$28.20	$1.70
Needham	20.00	5.00
Brookline	16.50	1.20
Gloucester	25.00	2.80
Arlington	27.40	3.20

MEETINGS

Calendar of Coming Meetings

Nov. 12-14—American Society of Municipal Improvements. —Annual convention, New Orleans, La. Secretary, Charles Carroll Brown, 304 East Walnut St., Bloomington, Ill.

Feb. 9-13, 1920—American Road Builders' Association— Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Apr. 12-17, 1920.—United States Good Roads Association. —Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Apr. 16-17, 1920.—Bankhead National Highway Association. —Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

New Jersey Association of County Engineers

At a special meeting of the New Jersey Association of County Engineers, held on Sept. 11, the following resolutions were adopted and ordered sent to all the municipalities of the state:

WHEREAS, The constantly increasing use of the highways in state, county and municipality demands the proper, economical and efficient development of all the highway systems in the selection of proper materials to be used in the construction and maintenance of same; and

WHEREAS, The selection of paving materials requires expert knowledge of the probable life of these materials when subjected to the different classes of traffic; and

WHEREAS, It has been the practice for many years for governing bodies to be influenced in the selection of materials to be used by petitions from owners of property abutting on the line of the improvement; and

WHEREAS, By such selection, the advice, opinion and knowledge of experienced engineers has been many times rejected, rsulting in the improper selection of paving materials,

THEREFORE, BE IT REESOLVED: That the County Engineers Association of the State of New Jersey does hereby strongly protest against and condemn the continuation of this practice, as being against the best interests of the municipality, conducive to excessive cost and contrary to the best engineering practice.

◆

The Colorado State Highway Commission is planning to illuminate the road between Colorado Springs and Denver, according to a recent report. The distance between the two points is 75 mi., and the work is to be done by the state authorities.

St. Louis County, Minnesota, recently voted what is said to be the largest bond issue ever provided by any county for road building. The issue amounts to $7,500,000 and the proceeds will be used for the construction of 270 mi. of road. The proposal was carried by a vote of about 9 to 1 and no district in the county voted against it.

PERSONAL MENTION

R. A. Nichols has been appointed county engineer of Williamson County, Texas.

H. Fred Starks has been appointed county engineer of Nassau County, New York.

E. C. Gwillim has been appointed city engineer of Sheridan, Wyo., succeeding H. M. Huntington, resigned.

R. S. Weiner has been appointed district manager of the Sullivan Machinery Co. at El Paso, Tex., succeeding Don M. Sutor.

Arthur Bladholm has been appointed highway engineer of Lyon County, Minnesota, succeeding D. W. Webster, resigned.

Carl Eisenhardt has been appointed assistant engineer in the Bureau of Contracts of the Indiana State Highway Commission.

Arthur C. Marble has resigned as city engineer of Lawrence, Mass. Mr. Marble has been city engineer of Lawrence since 1875.

Glenn I. Voyles, formerly County Engineer of Phillips County, Kansas, has been appointed county engineer of York County, Nebraska.

C. E. Healy has been made second assistant city engineer of San Francisco, Cal., succeeding A. J. Cleary, who has been made first assistant.

J. W. Benjamin has been appointed a division engineer of the Texas State Highway Department, for district No. 4, with headquarters at Amarillo.

A. J. Cleary, formerly Second Assistant City Engineer of San Francisco, Cal., has been appointed first assistant city engineer, succeeding H. W. Shimer.

J. K. McKeough has been appointed manager of the truck division of The Nash Motors Co., of Kenosha, Wis., succeeding L. F. Collins, who recently resigned.

A. R. Taylor, formerly County Surveyor of Hancock County, Ohio, has been appointed state highway commissioner of Ohio to succeed Clinton Cowen, resigned.

Rodman Wiley, for the past three years commissioner of public roads of Kentucky, has resigned to become chief engineer of the Kentucky Rock Asphalt Co., of Louisville, Ky.

D. W. Webster has resigned as highway engineer of Lyon County, Minnesota, to become a division engineer with the Minnesota State Highway Department. He will take charge of the northwestern section of the state.

J. D. Hanks, recently office engineer with the U. S. Geological Survey, has been appointed superintendent of state and federal aid projects with the Texas State Highway Department. He succeeds W. W. Carson, resigned.

C. C. Newburn has been appointed assistant sales manager of the Parker Motor Truck Co., of Milwaukee, Wis. Mr. Newburn has been identified with the automotive industry for about twelve years, during which time he has been connected with the sales departments of the Service, Diamond T., Corliss, Panhard and Traffic trucks.

T. M. Keene, Senior Highway Engineer of the Bureau of Public Roads, U. S. Department of Agriculture, has been transferred from the Portland office to the office at Missoula, Mont., to take the place of U. S. Marshall, resigned.

W. T. Ruth, who has been associated with the Good Roads Machinery Co., Kennett Square, Pa., for about 20 years, has resigned to become manager of the road machinery department of the Beaumont Mfg. Co., of Philadelphia, Pa.

Capt. G. R. B. Symonds has been discharged from service with the Engineers and has been appointed highway engineer in the Bureau of Public Roads, U. S. Department of Agriculture. Capt. Symonds will have charge of District No. 9.

T. H. Webb, of Dallas, has been appointed engineer of the material division of the Texas State Highway Department. Mr. Webb's duties will comprise the inspection of all materials used on work under supervision of the State Highway Commission.

Don M. Sutor has been transferred from the El Paso office of the Sullivan Machinery Co. to the company's St. Louis office, where he will act as district manager for Missouri, eastern Texas, Oklahoma, Kansas, western Kentucky and western Tennessee.

J. M. Dennis has resigned as eastern manager of the Austin Manufacturing Co. and the Austin-Western Road Machinery Co. and has become associated with the Reading Engineering Co. as secretary and treasurer, with offices at 154 Nassau St., New York, N. Y.

Clinton Cowen has resigned as state highway commissioner of Ohio to become consulting engineer for the National Sand and Gravel Association. Mr. Cowen has been state highway commissioner of Ohio for about four and one-half years. He will assume his new position on Jan. 1.

George H. Bryant has resigned as city engineer of Brockville, Ont., to take charge of the Brockville Highway Construction Co., which has been awarded the contract for the Brockville-Prescott section of the provincial highway. Mr. Bryant has been city engineer of Brockville for the past seven years.

Cresleigh Gray has been appointed engineer in charge of the Bureau of Contracts of the Division of Construction of the Indiana State Highway Commission. Mr. Gray is a graduate of Rose Polytechnic Institute and has been connected with the State Highway Commission since its organization several months ago.

Harry W. Benkart has been appointed to represent the Lakewood Engineering Co. at Buffalo, N. Y., with offices in the Ellicott Square Building. Mr. Benkart has had about ten years' experience in the construction line, most of it as superintendent of construction for the Dravo Construction Co. For the past five years he has had an agency for contractors' equipment at Buffalo.

EQUIPMENT—TRADE—MATERIALS

Hydrated Lime in Concrete

Too Wet Concrete Mixtures Frequent Cause of Difficulties in Pavement Construction

The use of too wet mixtures in concrete pavements is a common fault in construction, according to the Construction Bureau of the Lime Association.

Attention is called to this situation in connection with a job in Lucas County, Ohio., in which the specifications called for the use of 7½% of hydrated lime in the mixture. It was reported to the engineers of the Association that the lime was not giving the results expected and an engineer was sent to the job to determine the cause of the trouble, which he found to be the use of too much water.

The Association points out that the function of hydrated lime in a concrete mixture is to permit the use of the minimum amount of water in the mixture. It has been proved, according to the Association, that the ultimate strength of concrete depends very largely upon the water content, the maximum strength being obtained with an amount of water less than that which it is possible to use in actual practice, the mixture containing the proper amount being too dry to be workable. To remedy this condition, the use of the hydrated lime is advocated.

R. B. Everett & Co., of Houston, Tex., have been appointed selling agents for the Good Roads Machinery Co., of Kennett Square, Pa.

The Thew Automatic Shovel Co., of Lorain, Ohio., has recently issued a new catalog, designated as No. 11, illustrating and describing various types of the company's steam shovels. The catalog is 8½x11 in. in size and is profusely illustrated with descriptive matter which consists of general descriptions and detailed information on sizes, capacities and the construction of the machines.

A new catalog describing the Hall motor trucks has recently been issued by the Lewis-Hall Iron Works, of Detroit, Mich. The catalog is 8½x11 in. in size and consists of 24 pages, including covers. The contents include general descriptions and specifications of the company's line of 2, 3½, 5 and 7-ton trucks, with several pages of matter describing the construction of the machines.

The Eugene Dietzgen Co., of New York, N. Y., has recently issued the tenth edition of its general catalog of drawing materials and serveying instruments. The catalog is a cloth bound book of 406 pages 6x9 in. in size. It contains illustrated descriptions of the complete Dietzgen line of papers, drawing instruments, scales, inks, drafting room furniture, tapes, transits, levels, rods, poles and other field and office supplies. It is profusely illustrated, some of the illustrations being in color, and is accompanied by a paper-bound price list.

The Iroquois Works of the Barber Asphalt Paving Co., of Philadelphia, Pa., have issued a new catalog describing Iroquois asphalt paving tools. It is designated as Bulletin No. 6, and is an eight-page paper booklet, 8x10½ in. in size. The tools illustrated and described include heating kettles, fire wagons, surface heaters, rollers, pouring pots, tampers, rakes, shovels and other hand-tools. Free copies will be sent to engineers, contractors and others interested.

The J. I. Case Threshing Machine Co., of Racine, Wis., has recently issued a new booklet illustrating and describing Case road building machinery. The booklet is 4x9 in. in size and consists of 32 pages and covers. The machinery described includes road rollers, rock crushers, elevators, screens and bins, graders, drags, scrapers and plows. The booklet is profusely illustrated with pictures of the machines and of road work being done with them. The cover is printed in colors.

The Koppel Industrial Car and Equipment Co., of Koppel, Pa., has brought out a new general catalog of industrial cars and locomotives and tracks. It contains profusely illustrated descriptions of track and track fittings, cars of various kinds, electrically operated trucks and tractors, steam and electric locomotives and special equipment for industrial railways. The catalog is 12x9½ in. in size, with detachable cloth covers permitting insertion of additional pages. It is especially well printed and illustrated.

The Good Roads Machinery Co., of Kennett Square, Pa., has recently issued a new catalog of the "Champion" line of crushing, elevating, screening and conveying machinery. Included in the equipment illustrated and describing are complete crushing plants, jaw crushers, bins, elevators, screens, belt conveyors, portable engines and boilers, drills and other quarrying and crushing machinery. The catalog is 6½x10 in. in size and consists of 32 pages and covers. It is profusely illustrated and printed in two colors.

The Promotion and Inspection Bureaus of the Universal Portland Cement Co., of Chicago, Ill., were combined under the name "Service Bureau" on August 1. J. H. Libberton, formerly the engineer in the Promotion Bureau, has been made manager of the Service Bureau, and G. E. Warren has been made assistant manager. J. W. Lowell has been made eastern manager, with offices at Pittsburgh, Pa; J. H. Chubb, northwestern manager, with offices at Minneapolis, Minn., and O. L. Moore, chief cement inspector, with headquarters at Chicago.

State Highway Commissioner Charles J. Bennett of Connecticut has allotted $1,342,000 to the 147 towns of the state for the improvement of roads, exclusive of trunk lines and federal aid projects. The towns will appropriate $355,700.

Three Districts of Kanawha County, West Virginia, have voted road bond issues amounting to $1,459,000. The issue of Cabin Creek District was $904,000; that of Elk District, $395,000, and that of Union District $160,000.

The State Highway Commission of Colorado is asking certain counties to appropriate 25% of the state's share of the expense of building federal aid roads in those counties in order to prevent the loss of $900,000 of the money appropriated for federal aid road work in Colorado by its transfer to some other state. About $120,000 has been kept in Colorado by similar action on the part of the counties.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Road Graders

12 SIZES

Corrugated Culvert
Guide Signs
Screening Plants
Rooter Plows
Steam Rollers
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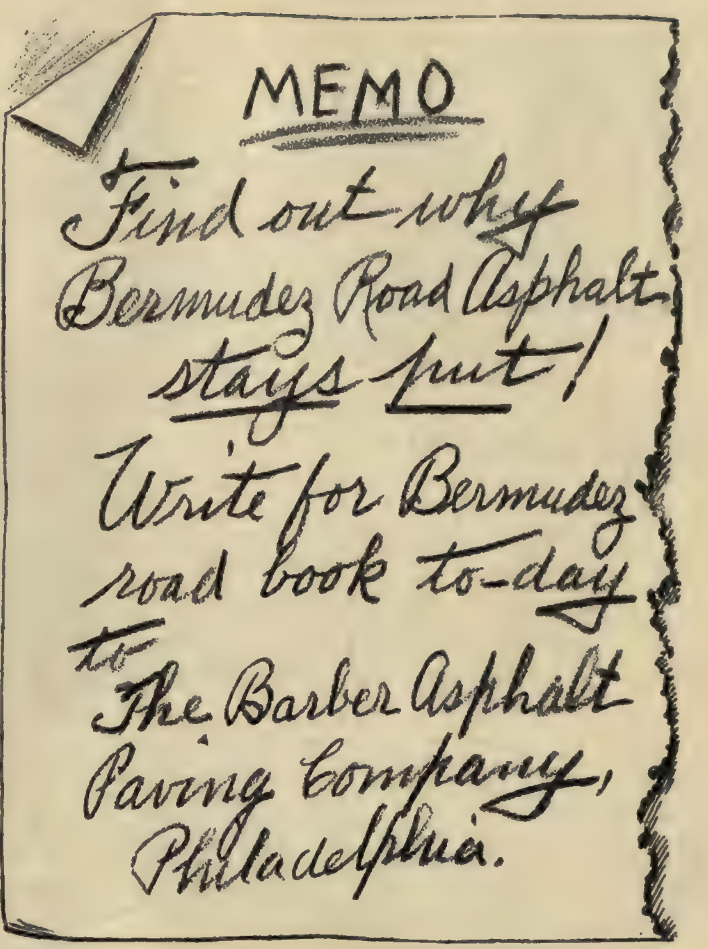

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What Winnetka thinks of Tarvia

THE VILLAGE OF WINNETKA
WINNETKA, ILLINOIS

November 18, 1918.

The Barrett Company
Chicago, Ill.

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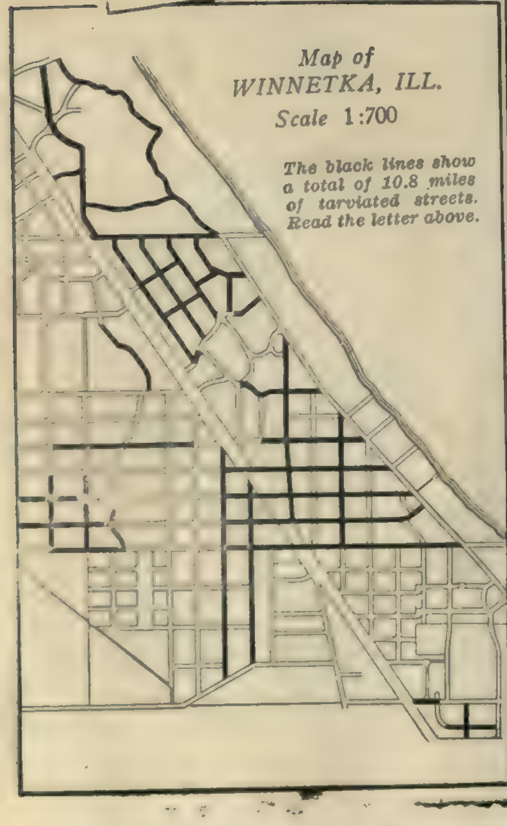
Two years ago this municipality adopted the policy of resurfacing all macadam streets within the village limits with "Tarvia A" and granite chips. Inasmuch as the close of the present season finds the program practically completed, we wish to take this opportunity of thanking you for your very excellent service in meeting our requirements, and to express to you our judgment that this method of maintaining macadam streets in high-grade condition is most satisfactory from the standpoint of economy, good appearance and durability.

Yours very truly,

THE VILLAGE OF WINNETKA
(Signed) H. L. Woolhiser
Business Manager



Map of
WINNETKA, ILL.
Scale 1:700

The black lines show a total of 10.8 miles of tarviated streets. Read the letter above.

How Winnetka, Ill., obtained beautiful streets at low cost

A FEW years ago Winnetka streets were much like those of hundreds of other villages to be found all over the country—beautiful homes on both sides, separated by muddy roads in wet weather and clouds of dust in dry weather.

Then the Village Council got busy. The property owners were canvassed and asked to contribute part of the cost of a good roads program.

The result was 5.8 miles of Tarvia streets laid during the first year, a third of the cost, amounting to 15 cents per front foot of the abutting property, being paid by the property owners and the rest by the village.

Last year all the rest of the macadam streets were tarviated, so that today Winnetka ranks among the best paved villages in America.

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVI.
New Series, Vol. XVIII.

NEW YORK, OCTOBER 1, 1919

Number
14

Highway Engineering*

Relation Between Highway and Railway Engineering—Growth of Motor Vehicle Transportation—Its Effects Upon Engineering Practice in Highway Work—Opportunities in Road Engineering

By W. G. THOMPSON†

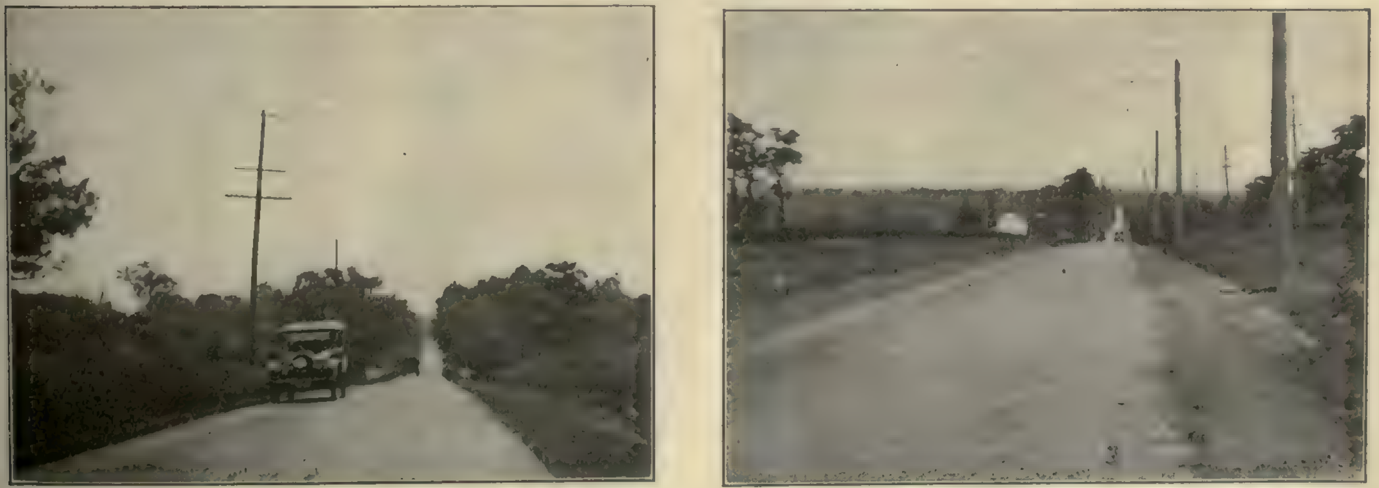
The relationship between railroad development and highway development is so intimate, and the railroad is dependent in such large measure upon the development of adequate highways to feed it with tonnage, that a brief discussion of the problems affecting the design and construction of highways may be of interest.

It has been said by a well known railroad executive that the railroad of the future may find it more economical to tear up short-line tracks and develop motor truck transportation instead.

Although the supplying of tonnage is the freight traffic manager's problem, it is also a problem which should engage the serious attention of the engineering department from the viewpoint that every means should be employed to reduce the cost of supplying tonnage to the main lines, just as careful attention is given in location and construction to reducing grades and curvature to the minimum. Enlarging on the above, it is claimed that, considered as units, few branch lines pay expenses, but as gatherers of freight and passengers to increase density of main line traffic, they are sources of profit. As, however, traffic gathered by them is turned over to the main lines with a deficit attached, which has to be overcome during the main line movement before any profit is made, it might be a decided advantage if this traffic could be delivered to the trunk line by means of the motor truck or tractor without this bill of expense attached.

Since it is a fact that it is now necessary to truck products of all kinds, and especially farm products, to the short branch line and load them into cars, a serious investigation of the matter may disclose that one handling might be obviated and considerable expense saved if the tracks were removed from many branch lines and the grades used for improved motor roads which could be entered from every intersecting highway.

Such an arrangement would mean increased facilities at



Section No. 1, State Highway, Route No. 1, Between Menlo Park and Metuchen.

Section No. 1, State Highway, Route No. 4, Between Middletown and Red Bank.

TYPICAL CEMENT CONCRETE ROADS IN NEW JERSEY.

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*An address delivered before the American Association of Engineers at a meeting in New York, N. Y., June 25, 1919.

†State Highway Engineer of New Jersey.

main line points for freight handling, but with the present rapid improvement of country and interurban highways it would relieve the railroads of the burden of maintaining freight stations, water systems, coaling stations, track and other structures, and the inevitable overhead expense during seasons when traffic is light.

It is inconceivable that trunk highways paralleling trunk lines of railroads will ever seriously affect the tonnage carried by the railroads, but it is quite conceivable that with the extensive building of hard, smooth, all-year highways, the tonnage of branch-line roads will be very seriously affected, and, in the speaker's opinion, should from now on engage the attention and induce careful investigation by the engineering departments of railroads whose managers are looking to the future and the economical handling and transportation of freight.

There are at present approximately 6,000,000 passenger motor cars in the United States, and conservative estimates place the passenger mileage of automobiles in the United States at 45,000,000,000 per annum. Commercial motor cars increased from 60,000 in 1912 to approximately 600,000 in 1918. Ton-mileage in all kinds of commercial motor cars is now estimated at 5,000,000,000 per year. It is estimated that there will be in use at the end of the next ten years 20,000,000 passenger and 5,000,000 commercial motor cars. Surely these figures should cause railroad officials more than casual concern and lead to the consideration of the matter of short-line hauls from the highway viewpoint.

Highway engineering today differs little from railway engineering. The same fundamental principles are involved in the original design of both, viz.: alignment, grades, curves, drainage of subgrade, bridges, superelevation of curves, etc. There must also be traffic regulations and signals, danger signs, distance and direction markers, etc.

Particular attention is being given to grades and curves, especially on the New Jersey state highway system where, except in very hilly country, 5% grades and 6 deg. curves are the maximum.

The advent of the swiftly moving motor vehicle soon demonstrated that earth and macadam pavements were unsuitable and uneconomical for that class of traffic; therefore, the most durable types such as concrete, stone block, asphalt and brick pavements are now being laid. Light foundations and inadequate drainage are the most fruitful causes of pavement failure, as they are in track construction. Systems for thorough drainage of the sub-foundation, such as lateral drains under the pavement, leading to longitudinal drains; the construction of storm sewers on a grade in long, level sections; and the construction of side ditches and gutters are essential. In the preparation of the sub-foundation, all areas of permanent saturation are removed and replaced by coarse sand or broken stone placed directly beneath the pavement. Experience is developing the fact that concrete provides the most durable and lasting foundation under heavy traffic. It is being used in rapidly increasing amounts as a pavement, and as a foundation for other types of pavements.

On country and interurban highways, graded widths from gutter to gutter are not less than 30 ft., and the hard pavement not less than 18 ft., widening to 24 and 30 ft. where several roads converge or when approaching large cities.

All curves exceeding 3 deg. are superelevated, as in railroad practice, in accordance with a formula devised for the purpose and based on a speed of 30 mi. per hour, though some of our banked curves have been driven over at 60 mi. per hour, presumably because the driver liked the sensation of rounding a curve at high speed without the effort of resisting the overturning force.

The laws of most Eastern States permit gross loads of from 24,000 to 30,000 lb. on trucks. Therefore, bridges are being designed for 20-ton loads, assuming 75% of the load as being on the rear axle.

The rapid increase in the use of motor vehicles makes pertinent the question as to whether we are building pavements sufficiently wide and foundations sufficiently heavy. The first is a matter of local finances; the second is one that can be determined only by experience and observation extended over a period of years. The speaker is connected with the State Highway Department of New Jersey, and on our most heavily traveled route, that between Newark and Trenton, we are laying a concrete pavement 8 in. thick at the sides and 10½ in. thick at the center. On all other routes, the pavement is being laid 6 in. at the sides and 8¾ in. thick at the center. It is believed that these will suffice for 15 or 20 years.

A comprehensive system of marking the highways with danger, distance and direction markers is being installed to enable the motorist to travel from place to place with convenience and safety, if he will but observe the traffic regulations and ordinary courtesy to others.

Highway and highway transportation engineering offer a broad, promising field to young engineers in the future. They also offer that which is becoming increasingly important to engineers as a whole and to the members of the American Association of Engineers in particular, as that organization was formed for the promotion of the economic and social welfare of engineers in this country, namely: opportunity to engage in public service work and, by the application of their special training and experience and the high ideals held by the engineering profession as a whole, secure the recognition justly due and heretofore withheld, except in isolated instances.

There are objections to employment in public service, the principal one being uncertain tenure of office due to changing political administrations. But it is within the power of the engineers of this country, by united and persistent effort, by educational propaganda, by the exercise of tact and good judgment, and by constant adherence to the high ideals which actuate 99% of our engineers, to so mold public opinion that, within a very few years the civil engineer may attain the social and economic status which is rightfully his, especially in the administration of public business and affairs.

To most engineers the idea of mixing or entering into politics is repugnant, but the present political system, and the appointment and election of misfits and unfits, will continue until the people of this great nation are educated to demand trained, experienced, practical men for the conduct of public affairs.

◆

Grasshoppers and Chickens seriously delayed the construction of a concrete road in Mercer County, Pennsylvania, according to a recent report. The work in question was on a road through a farming section which was infested with an unusual number of grasshoppers. The insects disturbed in the fields settled on the soft concrete and were followed by chickens from a farm near by, with the result that the soft surface of the pavement was ruined.

The Number of Motor Vehicles in Mexico City, according to statistics printed in a recent issue of the "Commerce Reports," is 5,493, divided as follows: Pleasure cars (private), 2,337; pleasure cars (for public use), 1,916; jitneys, 1,104; motor trucks, 136. The total number of cars in the Mexican Republic is 18,000. The report is also authority for the statement that dealers in Mexico City estimate that 2% of the population of that city is able to purchase cars and that the roads are in bad condition and that little is being done to improve them.

The Need of the Nation*

National Highway System Built and Maintained by the Federal Government Most Urgent Need of Nation—Mileages Required in Various Systems—Solution of Problem the Townsend Road Bill

By M. O. ELDRIDGE†

Thousands of clear thinking men and women now believe that a national system of roads, constructed, maintained and paid for by the Federal Government, is an urgent need of our country today, and second to no other thing. Such a system has been advocated by far-visioned statesmen from the early days of the republic to the present time. Our present commercial, social and military needs call for roads which cross and re-cross state lines, for traffic does not begin nor end at state boundaries. The character and condition of highways in a neighboring state are often of as much importance to a road user as the arteries of communication in his own state, county or community. A comprehensive system of highways selected by federal and state authorities and a program of construction and maintenance such as could be carried out under federal control would insure a higher standard of road building and repair than is possible under the present federal aid plan.

Under the present plan, by reason of the fact that the initiative rests with the states in the selection not only of the individual project, but the type of consruction also, there can be no uniformly high standard of durable types of highways. The varying degrees of financial ability on the part of the several states, the conception of legislators, officials and the people as to the extent to which the federal funds should be distributed and the differences in judgment among the forty-eight state engineers and the thousands of local engineers make impossible any real consistency in construction. Thus, on the same highway carrying heavy traffic one may find concrete, brick, bituminous macadam, or other high type, extending to a state line and suddenly dropping off to light gravel construction or even earth, because the next commonwealth was either unable or unwilling to meet this standard.

Of the 10,445 mi. of federal aid projects approved up to a recent date the distribution by types was as follows:

Types.	Miles.	Per cent. of Total.
Earth	3,223	30.9
Sand-clay	1,533	14.7
Gravel	3,167	30.3
Water-bound macadam	462	4.4
All other types	2,060	19.7
	10,445	100.00

Forty-five per cent. of the roads approved at the time this statement was prepared were of light construction, more or less temporary in character; 75% were of a type lighter than water-bound macadam, and only 20% of the roads were of a type which should be used on a state or federal system, where present-day and prospective traffic requires in most cases something better than earth, sand-clay, gravel, or even water-bound macadam. These figures tell the discouraging story.

It should be stated, however, in justification of our state and federal highway authorities that the legislatures and the people in many states insist that federal and state funds be spread out yearly so that each county will obtain a "small slice of the pie," thus perpetuating the practice of patching and makeshift construction for purely local purposes. In those states in which such a short-sighted policy prevails, it will be impossible for state or federal authorities to accomplish anything other than the building of roads that meet merely local needs.

Modern traffic requires that main routes be wide; that dangerous curves be eliminated; that substantial bridges be built; that road surfaces be durable, and that they be systematically maintained. In building detached individual projects, as often as is the case under the present federal aid act, the accomplishment of these purposes is difficult and in many cases impossible. For example, if a federal aid project is 2 mi. in length and is located on an important 10 mi. of highway it betters the situation very little to widen the road, cover it with a hard surface and keep it in good repair for the 2 mi. and leave it untouched for the other 8 mi. In many of the states the laws provide supervision of the highways by the state, while the bridges are under the care of the counties and in some states complete jurisdiction over both roads and bridges is vested in county authorities. This, of course, renders unified control in such states out of the question.

The day of individual roads, except as feeders to trunk lines and market roads, has passed. Highway improvements must be continuous and coordinated and the Federal Government should not encourage the continual individualizing of highway improvements through confining its efforts to the granting of aid to the individual highway which does not constitute a part of a well conceived system that justifies national consideration.

The Townsend Bill now before Congress calls for a national system which will meet our present and future needs. The bill provides that the Government shall take over, with the consent of the states, not less than 2% nor more than 4% of the most important highways of the country, selected by state and federal authorities, with this system constructed and maintained by the Government at Government expense. That such a system can be kept within 3% of the total road mileage of highways in the United States and still serve our greatest needs, has been definitely established by careful research. To make the point clear it may safely be stated that a zone 10 mi. in width and 25,000 mi. in length will reach more than 86% of the population of the United States, more than 85% of the taxable real estate and more than 55% of the tonnage of farm products. Such a system would include possible military roads having an aggregate length of about 10,800 mi., serve our Atlantic, Gulf and Pacific coast lines and also cover our Mexican and Canadian borders; would give access to our national forests and national parks, and open up much of the public domain not now easily accessible; besides affording trunk line routes for parcels post in the territories where this form of transportation is needed. It would also include adequate links in the national system in every state.

If, as a condition to the building of the national highways in each state, a construction of an equivalent mileage of state highways should be required, this would add 15,000 mi. of state highways, which, with the national system would aggregate 150,000 mi. of main trunk lines. With this double system, practically all of the 1,400 cities and towns of 5,000 population and over would be on the main system, as well as

(Concluded on page 166)

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*Paper presented at the 20th annual convention of the North Carolina Good Roads Association, Harbor Island, N. C., Aug. 13-15, 1919.

†Director of Roads, American Automobile Association.

Accidents at Railway Grade Crossings

Statistics on the Number of Accidents Occuring on the Public Roads at Railroad Grade Crossings and Methods of Prevention Discussed by Committee of Railway Claim Agents' Organization

Statistics on the number of grade crossing accidents which occur annually in the United States, a discussion of the existing statutes relating to grade crossings and of court decisions based upon these statutes, and suggestions for reducing the number of accidents were contained in a report submitted at the 1919 annual meeting of the Association of Railway Claim Agents by its Highway Crossing Committee.

In calling attention to the impossibility of eliminating all grade crossing—admittedly the only method of eliminating accidents—the committee pointed out that while in 12 years the Pennsylvania Railroad had expended $66,000,000 in grade crossing elimination, it would cost the company $600,000,000 more to do away with the 13,000 crossings that still remained, and also that, according to figures furnished by the Illinois Central Railroad Company, the elimination of the 8,000 crossings that still remained on its lines would cost more than the entire capitalization of the company.

According to figures from the Interstate Commerce Commission bulletins, which the report reviews, 1,912 persons were killed and 4,927 persons were injured by being struck by steam and electric railway trains at highway crossings during the calendar year ending Dec. 31, 1917. During the five and one-half years from July 1, 1912, to Dec. 31, 1917, 7,808 persons were killed and 21,672 persons were injured by collisions with steam and electric trains at highway grade crossings. This is an average of 1,419 persons killed and 3,940 injured annually. It is also pointed out that these averages do not tell the whole story since the number killed and injured has steadily increased each year.

"Because of the rapidly increasing number of collisions of its trains with automobiles at highway crossings," the report continues, "and the consequent shattering of the nerves of its enginemen, unfitting them for the very responsible duties of their positions, the Illinois Central Railroad Company in the years 1916-1917 had observations made at a large number of highway crossings on its railroad of the conduct of persons about to cross its track. It learned that 75% of these persons neither stopped, looked nor listened for possible approach of a train, but proceeded over the crossings without taking the slightest thought for their own safety or for the safety of the friends or relatives who frequently were with them.

"The heedless crossing user in California, in a similar observation test made by the Southern Pacific Company, was 67½% of the whole number, which, according to the committee's memory, was 7,000 persons. Human nature is the same everywhere."

The result of an investigation made by Vice President T. J. Foley, of the Illinois Central Railroad Company, is quoted by the report as follows:

"It is thought by many that if trains are required to go through towns slowly and softly, with enginemen and trainmen on the lookout, there will not be so much danger of accidents. The effect of this is to educate the public to become careless about railroad tracks. There ought never to be anything done toward teaching the public that railroad tracks are safe. The public ought to be taught that they are dangerous in the extreme, and the more dangerous they are the more care will be taken by the people themselves to avoid accidents. The idea of placing responsibility on the railroads for safety at railroad crossings is wrong. In theory it sounds fine, but in practice it does not prevent accidents. I believe the tendency of the people to rely on crossing flagmen, gates and alarm bells, instead of relying on their own faculties, has been responsible for more crossing accidents than it has prevented. Crossing flagmen occasionally err in giving signals and this results in accidents. The most approved gates once in a while get out of order—for a short time, it is true, but usually long enough to cause an accident. The same is true of alarm bells, and even when they are in order they ring so much that the public becomes neglectful of them. Crossings considered the most dangerous, we know from experience, are the scenes of fewer accidents than crossings considered comparatively safe."

In discussing statutes relative to grade crossings, the committee pointed out the futility of many of the existing laws as follows:

"Many people are of the opinion if there is any evil to be combatted, the best way to do it is to get a law passed forbidding it. These persons invariably overlook the fact that such special laws are not self enforcing and that where such laws are not directed against a universally recognized moral wrong and are designed only to abridge habits or practices customary to a large number of people, especially if restrictive of what they deem their individual liberty of action, and, depend upon a rewarded informer to give notice of their violation and on the testimony of fellow citizens to secure convictions, they are unpopular and prosecuting officers and administering magistrates dependent upon votes for being in and continuing in office are extremely indifferent to their enforcement, and such laws soon become obselete and are wholly forgotten—public sentiment fails to support them.

"The Chicago railroads, after spending $77,000,000 to separate their tracks from the public streets for public protection, found their elevations were made walkways of by the people, and many a good case made under drastic trespassing ordinances secured no deterring punishment from the law administering judges.

"Another illustration of the general ineffectiveness of this class of legislation consists of the state and city laws limiting the speed of automobiles on public streets and highways, prescribing the kind of lights to be used, etc. The committee anticipates general acquiescence in its assertion that the enforcement of speed limit laws against drivers of automobiles flagrantly violating them is so spasmodic and lax that police officers become discouraged and soon cease to make arrests.

"'Stop, Look and Listen' statutes have been urged as a remedy for the grade crossing accident, because there is general agreement to the proposition that if everybody stopped when necessary to hear or see, or even looked or listened in a genuinely interested manner, there would be no grade crossing accidents.

"Tennessee passed a statute requiring that this be done, but provided in the law that it should not be admissible in damage suits. Such a law carries in itself its own condemnation as a regulator of public conduct.

"You gentlemen know, no doubt, of other states that have a 'Stop, Look and Listen' law and therefore know better than the committee if this law accomplishes in any state the

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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FUTURE INCREASES IN MOTOR TRAFFIC

A more than tripled motor traffic on the country's roads ten years from now is what road builders have to look forward to, according to a statement made by W. G. Thompson, State Highway Engineer of New Jersey, in a recent paper before the American Association of Engineers.

There are at present approximately 6,000,000 passenger motor cars in the United States and probably at least 600,000 trucks. Ten years hence, according to Mr. Thompson, it is estimated that there will be in use 20,000,000 passenger cars and 5,000,000 commercial cars. He is also authority for the statement that "conservative estimates place the passenger mileage of automobiles in the United States at 45,000,000,000 per annum" and that "ton-mileage in all kinds of commercial motor cars is now estimated at 5,000,000,000 per year."

Assuming that these estimates are correct and that the prediction as to the increase in the numbers of passenger and commercial cars comes true, what will it mean to the road builders of the country?

It will mean that the annual passenger mileage will increase from 45,000,000,000 to 150,000,000,000 and that the ton-mileage of commercial cars will increase from 5,000,000,000 to approximately 41,500,000,000. In other words, there will be a 233% increase in passenger mileage and a 733% increase in the ton-mileage of commercial cars.

It is frequently stated that 80% of the country's traffic is carried on 20% of the roads and while this estimate is necessarily only approximate, experience and observation tend to bear it out. At present this 20% comprises only about 500,000 mi. of road, and while the extension of rural motor truck express and the increasing use of the motor truck by farmers and by other producers in more or less remote sections is going to distribute traffic more and more, the great volume of traffic will always be more or less concentrated on a comparatively small part of the total mileage. Therefore, even if the motor truck's penetration into territory hitherto undeveloped from a traffic standpoint, should result in increasing the percentage of the roads carrying the 80% of the traffic to as much as 30%, the volume carried by the roads comprising that percentage would be increased several times under the conditions predicted for 1929.

The significance of these figures—even were they twice too large—is obvious. The traffic of the future will have to be carried and the roads to carry it will have to be built. They will cost huge sums of money, but the money will be invested in something that will yield high returns. The task confronting the road builders and the taxpayers is a gigantic one, and an unavoidable one, but one well worth while.

ACCIDENTS AT HIGHWAY AND RAILWAY GRADE CROSSINGS

Several points in connection with the railway grade crossing problem that are distinctly worth noting are made in the report of the Highway Crossing Committee of the Association of Railway Claim Agents, which is reviewed on other pages of this issue.

One of the first is the impracticability of eliminating all existing crossings in the near future. On one line alone, as it is pointed out in the report, it would cost $600,000,000 to do away with the crossings yet remaining, and it requires no great knowledge of present conditions to appreciate the improbability of any such expenditures by the railroads as would be necessary for completing crossing eliminations.

Another point is that made by Vice President Foley of the Illinois Central, who is quoted as follows:

"There ought never to be anything done toward teaching the public that railroad tracks are safe. The public ought to be taught that they are dangerous in the extreme; and the more dangerous they are the more care will be taken by the people themselves to avoid accidents."

Still another point—and one that is applicable to some other things in the road field besides grade crossings—is made by the committee in calling attention to the prevalent belief that the way to abolish an evil is to pass a law forbidding it, even though the law is such that it will not and can not be enforced.

The grade crossing problem is a very real one and one that seems to be growing more serious in spite of efforts to reduce the number of accidents. What can be done by those in charge of the highways?

Obviously, since the elimination of grade crossings is the only sure method of preventing accidents, that work should be continued as rapidly as funds can be secured. In addition, every effort should be made to protect existing crossings in the most effective ways that can be found and to impress upon the public, especially the drivers of motor vehicles, the necessity for caution.

Of all prevention methods, the construction of "bumpers" in the roadway is the committee's choice. These are doubtless effective, but in a measure they are themselves dangerous and they are not practicable in all places. Gates and flagmen are perhaps the most effective safeguards, but their cost is such that their use is limited to busy crossings, usually in cities and towns. In the open country, reliance must be placed largely upon warning signs and upon affording the driver approaching a crossing an unobstructed view both ways along the track, so that he can exercise care if he will.

This brings the discussion back to the matter of care on the part of the road users—except for crossing elimination, the only solution of the problem of avoidable accidents. Most of the grade crossing accidents are in that class, and, as argued in the report, road users ought to be taught that railroad tracks are extremely dangerous—that they are never safe. Just as every man fit to have firearms always looks upon a gun as loaded, the driver of a motor car approaching a railroad crossing should do just what he would do were a train approaching—until he is absolutely sure that one is not.

There will doubtless always be some drivers who will refuse to take ordinary precautions, but by installing proper warning signs and signals and impressing upon drivers the necessity of heeding them, much can be done to reduce the number of accidents at the thousands of grade crossings that will have to remain for many years to come.

The Need of the Nation

(Continued from page 163)

every Atlantic, Pacific Gulf and Lake port. It would be possible to achieve at the same time a superb military system connecting every important fort and concentration point, arsenal and munitions center throughout the United States, while meeting industrial needs so completely that less than 5% of the population and the taxable values and less than 15% of the tonnage of farm products would be more than 5 mi. away from this joint national and state system.

It needs no profound statistical manipulations to demonstrate these points, for it can easily be understood that 150,000 mi. of highway with a zone extending for 5 mi. on each side would serve 1,500,000 sq. mi. of area or approximately half of the total area of the United States. The task of building the national system is well within the means of the nation and it is the duty of all good Americans to rally to the support of Senator Townsend's bill.

Pennsylvania Township Bonuses

State Highway Department Announces the Amounts of Cash Tax Bonuses for Years 1913 and 1914 Paid in Various Counties

The Pennsylvania State Highway Department has recently announced that payment of the cash tax bonuses due various townships for the year 1913-14 has been made by the State Treasurer.

Under the "Jones Dirt Road Act" of 1913, the road tax in townships must be collected in cash and cannot be paid in labor. This law also provided that the townships should receive from the state an annual bonus amounting to 50% of the total amount of road tax collected by the township, up to $20 per mi. of township road. The provisions of this act were suspended by another passed in June, 1915, until such time as all deficiencies incurred prior to 1915 were paid by the commonwealth.

During the 1919 session the Legislature appropriated $1,142,049.38 to pay all deficiencies due the township. The amounts paid to townships in various counties, are as follows:

Bradford, $27,972.15; Columbia, $13,939.15; Fulton, $4,695.35; Huntingdon, $12,043.57; Indiana, $28,526.73; Lackawanna. $8,471.87; Lawrence, $13,139.64; Lehigh, $16,470.32; Luzerne, $16,109.87; McKean, $10,460.43; Monroe, $11,780.83; Montour, $4,398.61; Northampton, $16,483.06; Northumberland, $13,799.00; Pike, $5,503.81; Potter, $12,316.74; Schuylkill, $17,386.52; Snyder, $8,809.40; Sullivan, $7,191.91; Susquehanna, $18,007.28; Tioga, $25,534.65; Union, $6,238.82; Washington, $32,108.61; Wayne, $17,792.68; Westmoreland, $40,966.56.

Kansas Weather Reports on Roads

Plan Tried by Kansas Weather Bureau as a War Measure Proves Popular with Road Users—Effort to Continue Being Made

According to reports from the Weather Bureau office at Kansas City, Mo., the highway weather service commenced by the Department of Agriculture as a war measure in aid of motor transportation has proved very popular with motorists. The meteorologist in charge of the Kansas City office recently reported as follows:

"The demand for a road reporting service is quite general and insistent and it will continue so, increasingly, until dirt roads become an anachronism. This office established a road or highway reporting service April 1 of this year and, without exaggeration, it is equal to the most practical service which our office otherwise can perform. It amounts to the direction of public motor travel, and persons start or postpone trips as we advise."

Although Congress made no appropriation for the continuance of this service during the present year, the Department of Agriculture has announced that, because of the demand for it, efforts are being made to continue it without special funds.

M. I. T. Seeking Endowment

Special Committee Carrying on Campaign to Secure Money to Meet the Conditions of Provisional Donation of $4,000,000

The Massachusetts Institute of Technology is endeavoring, through a special endowment fund committee, to raise a $10,000,000 endowment fund before the first of the year. A man, whose name has not been divulged, has promised $4,000,000 provided the alumni and friends of the Institute raise another $4,000,000 for an unrestricted endowment fund. It is stated that the man in question is not a Technology graduate or a Massachusetts man, but is an industrial leader of large wealth who believes in technical education. Dr. Maclaurin, President of the Institute, has promised to reveal his name at the end of the campaign.

It is stated that the need for a larger endowment is great, as it costs $200 more than the $300 tuition fee to give a student an education. It is also pointed out that the cost of technical education is rising rapidly and that unless subtantial increases are made in professors' salaries none but inferior men will be available.

The endowment fund committee is headed by Gen. Coleman du Pont, of the Delaware State Highway Commission, who is also the builder of the du Pont Road in Delaware. Gen. du Pont is a graduate of M. I. T. and has always been an du Pont is a graduate of M. I. T. and has always been an enthusiastic and practical advocate of good roads. The other members of the committee are: Charles Hayden, Edmund Hayes, Otto H. Kahn, Richard C. Maclaurin, Everett Morse, Charles A. Stone and Theodore N. Vail.

Prison Labor is to be Used in Callaway County, Minnesota, as the result of the failure of contractors to bid on the construction of about 7½ mi. of gravel road recently advertised. The work is on a state and federal aid project and was twice advertised. The estimated cost of the entire work is $54,986.

The Indiana State Highway Law has been attacked through a suit for an injunction to restrain the Highway Commission from carrying out the provisions of the law. The suit, which was filed in the Clay County Circuit Court by James C. Campbell, a citizen, attacks both the state law and the federal aid law as unconstitutional.

HIGHWAY TRANSPORTATION

Trucks Haul Maryland Peaches

Fruit Growers at Berlin Use Two White Motor Trucks to Market the 60,000-Bushel Crop from a 2,500-Acre Peach Orchard

The handling of highly perishable foodstuffs, such as peaches and other fruits, in which swift and sure transportation is necessary, is one of the many fields in which the motor truck is proving its worth. An instance of the manner in which motor trucks are being used in service of this character is furnished by Harrisons' Nurseries at Berlin, Md., where two White trucks are employed.

These nurseries are owned by State Senator Orlando Harrison and his brother, A. G. Harrison, and occupy about 7,000 acres, with nurseries and orchards scattered over an area within a radius of about 14 mi. of the packing house situated on a spur track of the Pennsylvania Lines. The peach orchards comprise 2,500 acres of trees and this year's crop amounted to 60,000 bu.

The fruit is picked into ⅝-bu. baskets which are loaded on the trucks and hauled to the packing house for transfer to refrigerator cars. Ordinarily the trucks carry from 150 to 175 baskets each, and make from 12 to 15 trips daily. On one particularly busy day, one of the trucks made 13 round trips, carrying 184 baskets on each trip, and also made two runs to an orchard 4 mi. away to carry employees. On another occasion one of the machines carried a force of Harrison pickers to an orchard at Easton, in which the Harrisons are interested, aided in gathering $16,000 worth of peaches and carried its crew 75 mi. back to Berlin—all in six days.

In discussing the use of trucks in peach growing, G. A Harrison said, in a recent interview:

"Picking and packing peaches is all rush work. When the peaches are ready we must be ready to pick and move them, smoothly and swiftly. We simply must have transportation equipment that can be depended upon at all times. In summer temperatures a few hours' delay may ruin hundreds of dollars' worth of fruit or entail losses through idleness of employees."

During the greater part of the year outside the peach season, the machines are used for various other work in connection with the nurseries.

Systematizing of Truck Lines Needed

Maximum Returns from Truck Lines and a Reduction of Living Costs Obtainable by Systematic Organization of the Existing Lines, According to Leading Truck Maker

At least a partial solution of the high cost of living lies in the systematic organization of existing motor truck express lines and the intelligent establishment of new routes, according to E. A. Williams, Jr., President of the Garford Motor Truck Co. In a recent interview Mr. Williams said:

"To obtain maximum returns from motor truck transportation, the numerous lines now operating should be systematically organized. Without a unity of purpose, there is a capacity waste in every community. This naturally results in a loss of tonnage and increased costs. It has been said that 70% of the motor truck operating in the United States during 1918 traveled empty one way. From these figures it was estimated there was a capacity waste of 283,500,000 tons during the year.

"With the establishment of highway transportation commisions in the various states and the organization of transportation bureaus in many of our cities, this tonnage waste is being eliminated. In several cities the haulage concerns have formed associations and have established central offices from which the motor truck transportation activities of that particular community are directed. These associations are affiliating with associations in near-by cities in order to further decrease the possbility of idle

WHITE TRUCK HAULING PEACHES IN A MARYLAND ORCHARD.

trucks and light return loads and to increase the general efficiency of the service.

"The motor truck actually has become a public utility in many localities. Entire communities are depending upon it as a means of supply. It has become equally as essential as the railroad and waterway.

"To obtain maximum efficiency, the transportation units of the country—the railway, waterway and highway—should be linked up systematically. More highways should be built, the present highways improved and a greater number of motor express lines touching those sections not reached by either rail or water, should be created.

"That such a system would have important bearing upon reducing the cost of living essentials is apparent. Available Government figures show that in 1918 the cost of shipping by truck throughout the country was from 10 to 30 ct. per ton-mile lower than the cost by horse-drawn vehicles. One can at least imagine what this will amount to in a year.

"Speakers before a recent convention of retail and wholesale grocers in Toledo voiced the opinion that their hope of reducing prices lay in the motor truck. Practically an entire session of the convention was devoted to this phase of the transportation problem, which they deemed highly responsible for the present high costs.

"One speaker, an officer of the grocers' organization, declared that the motor truck held the actual solution of the problem.

"This recognition of the motor truck as a transportation factor, coming from men who analyze and understand conditions governing the markets, is noteworthy and should be taken as convincing proof of its worth."

Electrics in Express Service

Official of the American Railway Express Company Gives Data on Costs of Operating Its Electric Trucks in Different Cities

Since the sole function of the American Railway Express Co. is transportation, records of its experience with motor trucks and data on its operating costs should be especially valuable. Somewhat extensive information of this character was given in a paper presented before the Electric Vehicle Section of the National Electric Light Association at its 42nd annual convention this year by E. E. La Schum, General Superintendent of Motor Vehicle Equipment of the company.

According to Mr. La Schum, the several express companies that are now merged into the American Railway Express Company commenced buying motor vehicle equipment in 1907 and are now operating 1,058 electric trucks in 23 different cities. He believes this type of truck to be particularly adapted to the peculiar needs of the express business, since it calls for short hauls and frequent stops, and the driver is primarily an expressman and not a chauffeur. While the trucks are used by the express company chiefly in congested districts, larger machines, such as the 3½ and 5-ton types, are also used in what is known as transfer service where the run is continuous and the loads are heavy. They are used in work of this kind, according to Mr. La Schum, in all places where the day's mileage does not exceed 40 mi., which the company has found to be the capacity of properly selected batteries. He also states that the life of machines has been proved to be at least eleven years, since the company still has in operation some of the trucks that were purchased in 1907. He also expresses the belief that the type now being manufactured can be operated economically for as long as 20 years.

In the accompanying table are shown average operating costs from July 1, 1918, to Dec. 31, 1918, in an eastern, a central and a southern city.

AVERAGE COSTS OF ELECTRIC VEHICLE OPERATION BY THE AMERICAN RAILWAY EXPRESS CO. IN THREE CITIES

	Costs					
	Boston		Cleveland		Memphis	
Item.	Total for 6 mos.	Average per month	Total for 6 mos.	Average per month	Total for 6 mos.	Average per month
Days in service	138	23	137	23	156	26
Total mileage	2,942	490	2,970	495	3,643	607
Electricity	$57.03	$9.50	$60.53	$10.09	$143.21	$23.87
Battery repairs	......	......	$74.33	$12.39	$47.08	$7.85
Tire repairs and renewals	$44.01	$7.34	$2[illegible].98	$4.33	$35.04	$5.84
Painting	$3.89	.65	$8.27	$1.38	$7.85	$1.31
Body repairs	$30.89	$5.15	$28.51	$4.75	$40.05	$6.67
Chassis repairs	$198.40	$33.07	$152.32	$25.39	$23.26	$3.88
Garage expenses	$221.61	$36.93	$85.69	$14.28	$109.35	$18.22
Total expenses	$555.83	$92.64	$435.63	$72.61	$405.84	$67.64

Plans of the Transportation Bureau of the Federal Highway Council

The Federal Highway Council which, as was noted in "Good Roads for Sept. 24, has arranged for the taking over by its transportation bureau of the work formerly done by the Highways Transport Committee of the Council of National Defense, has formally announced its aims and objects, as follows:

"To assist in coordinating the highways with the other transportation agencies of the country; to encourage the development of highways that will advance the economic life of the nation; stimulate their use in such a manner as to facilitate and cheapen the transportation of food, raw materials and finished products, and to cooperate with government agencies, both state and national, to the end that our highways may be of maximum service in the transportation system of the country."

Some of the specific objects which the bureau will seek to obtain in carrying out its announced policy are as follows:

"To recognize the problem of the road builder.

"To realize the needs of the road user.

"To visualize future highway transport requirements.

"To cooperate with the railroads and waterways to the end that the public may have in full that form of transportation which is most efficient, economical and practical.

"To study the problems attending the entrance of the motor truck into our commercial life in order that we may assist the industry which is industrially great and financially strong, in its efforts to be economically right.

"To promote uniform legislation and encourage every movement for the safety of life and limb on the highway.

"To encourage the establishment of motor express lines, where such lines will insure a fair return to the investor and serve a useful purpose in the community.

"To gather such information and statistics as will be of value to those interested in determining the economic field for highway transport, and act as a clearing house for the dissemination of the same."

Garford Adds 1¼-Ton Truck to Its Line

The Garford Motor Truck Co., of Lima, Ohio, has recently announced the addition of a 1¼-ton machine to its line of motor trucks. The new truck is designated as Model No. 25, and is shown in the accompanying illustration.

The engine is of 22 h.p. S. A. E. rating, with 4 cylinders 3¾x5⅛ in. Provision is made for electric lights and an electric starter, the model shown in the illustration being so equipped. When electrical equipment is required, the magneto is driven in tandem with the generator, thereby eliminating the necessity of chains. Oiling is by constant level splash system, and ignition is by high tension magneto controlled from the steering column. The clutch is of the multiple dry-disc ball-bearing type enclosed in a housing attached to the fly-wheel case, and the transmission is of the three-speed selective type.

The truck is equipped with two independent sets of brakes operating on the rear wheels, and the control is of the standard type with the steering wheel on the left and the brake and clutch at the center of the chassis. The lamp equipment includes two side oil lamps mounted flush in the dash and one oil rear lamp.

1¼-TON TRUCK RECENTLY ADDED TO THE GARFORD LINE—MODEL SHOWN IS EQUIPPED WITH ELECTRIC STARTING AND LIGHTING SYSTEM AND PNEUMATIC TIRES.

The electrically equipped model shown in the illustration also has two electric lights in front. The standard tire equipment consists of solid tires 36x3½ in. in front and 36x4 in. in the rear, but pneumatic tires are also furnished, as shown in the illustration.

The price of the chassis, including a full set of tires, is $1,890, f.o.b. Lima, Ohio. Pneumatic cord tires 36x6 in. all around, a power tire pump and an extra rim are furnished at $285 extra. The electric lighting and starting equipment is $125 extra.

Increasing Use of Trailers

Trailer Makers Increasing Facilities to Handle Growing Business—Greater Demand Partly Due to Use of Trailers and Semi-Trailers in Hauling Produce

Sales much greater in volume than those of a year ago, and a steadily increasing demand, are reported by manufacturers of trailers, according to the Trailer Manufacturers' Association of America. The manufacturers have been very busy since the close of the war getting ready for new business and many of them have moved into larger plants, erected new factories or extended their producing facilities by other means. In addition, several new companies have been organized to manufacture trailers and some companies in other lines of manufacture have entered the trailer field.

One of the factors in the increased demand for trailers, according to the Association, is their growing use by farmers and fruit growers. For this purpose light 2-wheeled or 4-wheeled vehicles are used with passenger cars for hauling to market small quantities of farm produce that might otherwise be wasted or fed to livestock. These lots are so small that it would not pay to take the time to haul them to market with teams, but they are of sufficient value to justify the use of the passenger car and trailer for the short time necessary to take them to town. The commodities handled in this way include milk, butter, eggs, live poultry, fruit and vegetables and, in some cases, live pigs, calves and cows.

Semi-trailers are used where there is somewhat heavier hauling to be done, loads of 2 and 3 tons being carried on semi-trailers hauled by runabouts and touring cars. In such cases the rear deck of the runabout, or the body of the touring car back of the front seat, is removed and a fifth-wheel device bolted to the frame over the rear axle to support the front end of the semi-trailer. This permits detaching the trailer at will and does not interfere with the use of the car for either business or pleasure driving.

Accidents at Railway Grade Crossings

(Continued from page 164)

purpose for which it was enacted. The Missouri Legislature at its 1919 session refused to pass such an act.

"Many towns and cities have passed stop, look and listen ordinances. These same towns have speed restricting ordinances also intended to protect the lives and limbs of their citizens. So long as the latter ordinances are laxly enforced, if at all, what hope is there for the enforcement of an ordinance designed chiefly to protect its violators from death and injury?"

The committee expressed a belief that if drivers of automobiles knew there would be no redress for them if they failed to exercise proper care in crossing railroads, that knowledge would be a strong inducement for them to exercise reasonable prudence, but it did not express any belief in the adequacy of the various means, such as warning signals, watchmen and the like, of eliminating accidents.

The remedy that was recommended by the committee as "the simple and practical solution of the crossing accident problem" was the construction of "bumpers" in the highway by highway officials "with the double purpose in view of compelling a reducion of auto speed and, by means of a severe jolt, putting such brains as the autoist may possess into active precautionary cerebration."

In support of this measure it cited the following examples:

"A popular road for autoists to some country clubs, chicken palaces and other country resorts in the vicinity of St. Louis passes through the thriving suburban town of Kirkwood, 13 mi. out. Any autoist who approached, went through and continued beyond that place at a speed of less than 30 or 40 mi. an hour would, a few years ago, have been run over by the top speeding throng following in his wake. The lives and limbs of the men, women and children of Kirkwood, who attempted to cross this highway day or night, were in great peril. Kirkwood armed for battle with as drastic an anti-speeding law as its most imaginative and ingenious citizen could frame. Kirkwood also had city marshals, constables and magistrates in plenty who were anxious to apprehend and punish any who disregarded the mandate of their city. Great cunning was developed by these marshals and constables to effect the arrest of violators of their law, and austere magistrates were severe in punishment when given the opportunity, but speeding did not stop—it increased. All that the marshals and constables caught of those in the high-powered, expensive cars was their dust. Autoists in less swift machines who were caught and fined felt themselves to have been distinguished above their fellows and took a few extra drinks on that account. Those in the speedy machines who got by did not omit to celebrate and boast of that feat. Kirkwood, discovering the futility of the law, took recourse to the 'bumper,' installing one on every block through the town, which quickly ended the competition in speed and wits between the autoists and the Kirkwood constabulary. Autoists ever since have passed through that village very slowly, gently and quietly. Thus the 'bumper' proved itself a safety measure and a peace and quiet enforcer superior to a law and its minions.

"The City of Memphis, Tennessee, has many streets crossing both steam roads and electric car line tracks at grade. Serious accidents on that account were frequent. Memphis did not set up a 'holler' for the installation of crossing gates, automatic bells, wig-wags, crossing watchmen and separation of grades, and load the railroads with the expense, nor did it pass any 'Stop and Listen' law, but it did install the bumper at its own expense and maintains it, and the bumper effectively did the business that was desired. Memphis was so pleased with the results that the bumper got for it at railroad crossings, that the city protected a speedway it had constructed for fast pleasure driving from too sudden intrusion by joy riders from a country club, the road from which connected with the speedway at the foot of a hill. This bumper so impressed itself on the minds of country club parties that they utterly lost all inclination to speed until after getting into the boulevard the city had especially provided for rapid driving."

MEETINGS

Calendar of Coming Meetings

Nov. 12-14—American Society of Municipal Improvements. —Annual convention, New Orleans, La. Secretary, Charles Carroll Brown, 304 East Walnut St., Bloomington, Ill.

Feb. 9-13, 1920—American Road Builders' Association— Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Apr. 12-17, 1920.—United States Good Roads Association. —Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Apr. 16-17, 1920.—Bankhead National Highway Association. —Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

St. Louis Chamber of Commerce

A meeting of the Good Roads Committee of the St. Louis Chamber of Commerce was held at the Hotel Statler, St. Louis, Mo., on Monday, Sept. 22. Among the speakers were S. M. Williams, Chairman of the Federal Highway Council; Maj. Harry B. Hawes, Chairman of the Good Roads Committee of the Automobile Club of St. Louis; Chairman E. L. Sanford, of the State Highway Board, and State Highway Engineer Alexander W. Graham.

Mr. Williams spoke at some length upon the Townsend Bill, urging its adoption as furnishing the best solution of the problem of providing roads to carry interstate traffic. He said that in his opinion it would take many years to complete the state systems under the federal aid allotments and by the methods now in use, and that at the present rate of highway construction it would be 50 years before a few roads in all of the states could be connected to form a federal system, and at least 100 years before the roads in all the states necessary to form an adequate system of national highways could be improved.

PERSONAL MENTION

William F. Cocke has resigned as state road commissioner of Florida.

Linn Brown has been appointed city engineer of Jefferson City, Mo.

W. E. Arnett has been elected director of streets of Fairmont, W. Va.

S. E. Colony, of Renovo, Penn., has been elected borough engineer of Ridgway, Penn.

Paul Hartung, Deputy County Engineer, of Jackson County, Missouri, has been appointed engineer of sewers.

A. M. Vance has become connected with the paving department of the Henry Exall Elrod Co., of Dallas, Tex.

Robert Kerr has been appointed county engineer of Atchison County, Kansas, succeeding Roy D. Coleman.

J. W. Kaerth, formerly county surveyor of Colusa County, California, has entered private practice at Colusa. He will specialize in reclamation and irrigation work.

Joseph A. Whelan, formerly of Trenton, N. J., has been appointed assistant superintendent in the Michigan State Highway Department, with headquarters at Ann Arbor.

Charles A. Brown, of Orlando, Fla., formerly a division engineer of the State Road Department of that state, has been appointed state road commissioner of Florida, succeeding William F. Cocke, resigned.

Roy D. Coleman, who has been county engineer of Atchison County, Kansas, for several years, has been appointed a resident engineer for the Government on the construction of roads in the Atchison district.

Capt. G. L. McLain, formerly city engineer of Hutchinson, Kan., has been appointed an assistant engineer with the Bureau of Public Roads. Capt. McLain has been assigned to the Omaha district and will have charge of work in Kansas.

OBITUARIES

Charles T. Church, formerly City Engineer of Geneva, N. Y., died recently, aged 85. He was a graduate of Union College and a member of the American Society of Civil Engineers. He was city engineer of Geneva from 1902 to 1909.

Thomas H. Collins, an engineer with the Denny Renton Clay Co., of Seattle, Wash., since 1912, died recently at his home in Seattle after an illness of two years. Mr. Collins, who went to Seattle from Cleveland, O., some years ago, had specialized in brick paving work.

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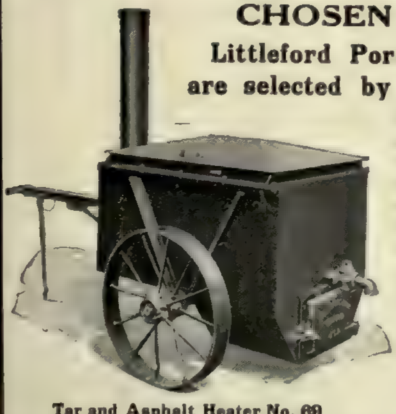

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NEW YORK, OCTOBER 8, 1919

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15

Highway Expenditures in the Year of 1918.

Data Compiled by Bureau of Public Roads Indicate a total Expenditure of $300,000.000 on the Country's Rural Roads.

By ANDREW P. ANDERSON†

Based on complete reports from 44 of the states, cash expenditures on the rural roads and bridges of the United States for the calendar year 1918 amounted to $286,098,193. To this should be added the value of statute and convict labor, which cannot be fixed with any great degree of accuracy but probably amounted to not less than $14,000,000, thus making the grand total expenditures for the year $300,000,000. This total is made up of actual expenditures for such items as labor, materials, supervision and administration directly connected with the construction improvement, and upkeep of our public roads and bridges outside the limits of incorporated towns and cities, and does not include any item for sinking fund payments or redemption and interest on road and bridge bonds.

The year 1918 offered an unprecedented condition in practically all lines of highway work. There was not only a tremendous increase and expansion in the amount of heavy truck traffic on our public roads and an unprecedented shortage in regard to road materials, labor, and ready funds, but also a decided increase in maintenance work, which was, however, partially offset by a decrease in the amount of new construction.

Cost of Maintenance Increased

The most striking single development through the year was the tremendous increase in motor truck traffic. Five years ago heavy motor trucks were few in number and limited practically entirely to the paved streets of our larger cities. These vehicles now comprise probably 4 to 5% of the grand total of all our motor vehicles and are to be found wherever traffic conditions permit of their profitable use. But very few of our present roads were designed to carry any large volume of this class of traffic. Consequently, the cost of adequate maintenance was increased greatly during the year. In many places the damage due to the incessant pounding of these fast and heavy vehicles was so great as to require complete reconstruction.

The undertaking of new construction work was of necessity deferred to a large extent during 1918. However, in spite of a sadly reduced and broken organization due to the demands of war, there continued throughout the year among the several state highway departments a decided forward looking movement to the time when hostilities should be ended. This movement consisted largely in formulating definite plans for the renewal of all lines of activities on an increased scale at the earliest possible moment. Thus, Illinois and Pennsylvania each voted bond issues providing for the construction of a comprehensive system of state road, with the understanding, however, that none of the money should be expended until after the war closed.

Vast Sums for Roads

The full effect of this movement, however, did not become apparent until the early part of 1919, when state and county governments began to make provision for road funds to an extent entirely unknown before. Thus, between Nov. 1, 1918, and July 4, 1919, state highway bonds were voted as follows: Illinois, $60,000,000; Pennsylvania, $50,000,000; Michigan, $50,000,000; California, $40,000,000; Oregon, $12,500,000; South Dakota, $4,500,000; Utah, $4,000,000; Wyoming, $2,800,000; Nevada, $1,000,000; or a total of $224,800,000. Other states have made definite provisions for submitting to a vote of the electors between June 30, 1919, and December 31, 1920, bond issues as follows: Minnesota, $75,000,000; Texas, $75,000,000; Missouri, $60,000,000; West Virginia, $40,000,000; Washington, $30,000,000; Montana, $15,000,000; Maine, $10,000,000; Colorado, $5,000,000; Idaho, $2,000,000 and New Mexico, $2,000,000 or a total of $314,000,000. Alabama, Georgia and Virginia are each contemplating making provisions for submitting the question of issuing state highway bonds to the voters.

On May 6, 1919, the electors in Oklahoma defeated a state road bond issue providing for $50,000,000. In New York the question of submitting to the voters a provision for issuing $20,000,000 in road bonds was vetoed by the gover-

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*From an article entitled "State Highway Mileages and Expenditures in the Year 1918" in "Public Roads", the official publication of the Bureau of Public Roads, United States Department of Agriculture

†Highway Engineer, Office of Public Roads United States Department of Agriculture.

nor, as was also a provision for authorizing $20,000,000 in the state of Arizona.

Increase in Federal Aid

The Federal Government also made provision for a considerable increase in the amount of funds available under the Federal Aid Road Act of July 11, 1916, for the improvement of rural post road and forest roads. The Post Office appropriation act, approved February 28, 1919, carried an amendment to the above act which provided for an additional appropriation of $209,000,000 for federal co-operation in the improvement of rural post roads and forest roads to be available during the years 1919, 1920, and 1921.

TABLE I.—Expenditures During the year 1918 By and Under the supervision of the State Highway Departments

State.	Funds.				Distribution of expenditure.						State funds available, 1919 (approximate).	Local road and bridge expenditures, 1918, not under State highway department (approximate).
					Construction.		Maintenance, roads and bridges.	Engineering.	Administration.	Equipment and miscellaneous.		
	Federal.	State.	Local.	Total.	Roads.	Bridges.						
Alabama	$133,380.90	$103,285.32	$134,547.20	$371,213.42	$314,163	$27,230		$18,262	$11,559		$350,878	$2,000,000
Arizona [1]	31,947.35	975,801.95	10,000.00	1,017,749.30	608,677	191,093	$82,255	68,285	44,552	$22,888	1,500,000	1,000,000
Arkansas	41,778.52	221,831.24		263,609.76	229,997	16,304		9,808	7,500		700,000	1,700,000
California	26,399.00	6,941,192.00	29,179.00	6,996,770.00	5,237,420	([2])	894,921	324,720	234,392	305,317	6,500,000	[3] 14,649,868
Colorado	250,000.00	800,000.00	400,000.00	1,450,000.00	410,000	120,000	800,000	([4])	100,000	20,000	1,000,000	1,850,000
Connecticut	5,301.15	3,172,706.35	396,600.08	3,574,607.58	1,640,707	295,927	1,256,565	165,023	23,285	193,101	4,000,000	1,444,212
Delaware	5,268.40	429,734.43	208,373.86	643,376.69	606,606	8,050	2,153	24,632	1,936		1,500,000	300,009
Florida	9,972.55	179,807.22	328,722.38	518,502.15	389,111	3,664	80,092	33,321	8,196	4,118	732,430	5,245,703
Georgia	21,158.00	15,000.00	55,898.00	92,056.00	72,368	800		18,888	([5])		15,000	5,700,000
Idaho	48,936.00	491,342.00	479,642.00	1,019,920.00	651,033	133,796	115,540	93,423	22,384	3,744	1,000,000	2,500,000
Illinois		860,910.99	1,216,312.87	2,077,223.86	1,787,357	59,669	65,557	129,030	30,911	4,700	10,000,000	8,106,129
Indiana											4,000,000	13,000,000
Iowa	75,853.12	113,488.49	14,360,280.61	14,549,622.22	2,931,526	4,972,168	4,158,254	453,870	([5])	2,033,804	4,000,000	
Kansas	8,083.90	25,000.00	1,922,766.10	1,955,850.00	131,250	1,600,600		225,000	([5])		25,000	3,061,267
Kentucky		1,000,000.00	580,000.00	1,580,000.00	1,100,000	300,000	60,000	65,000	25,000	80,000	1,500,000	1,800,000
Louisiana [1]		182,295.00	358,681.00	540,976.00	430,708	35,984	9,841	42,107	20,060	2,276	200,000	3,000,000
Maine	81,611.96	1,570,493.75	707,309.05	2,359,414.76	1,333,776	263,500	613,805	60,129	42,941	45,265	2,010,000	1,500,000
Maryland	4,767.73	2,681,141.89	64,225.50	2,750,135.12	1,064,674	105,875	1,368,860	68,601	24,425	117,700	3,800,000	3,000,000
Massachusetts	33,440.00	3,522,493.89	568,369.00	4,124,302.89	1,389,153	3,150	2,365,794	188,688	60,535	116,984	4,597,500	5,000,000
Michigan [1]		1,704,359.00	3,968,794.00	5,673,152.00	5,125,224	187,751	247,178	62,000	43,000	8,000	2,000,000	5,000,000
Minnesota	224,357.76	1,870,336.01	3,300,216.08	5,394,909.85	3,146,867	942,119	1,000,867	([4])	305,057		2,529,049	5,172,801
Mississippi		10,000.00		10,000.00				2,500	7,500		10,000	750,000
Missouri		704,400.00	450,000.00	1,154,400.00	900,000		181,000	17,600	38,800	17,000	3,000,000	6,000,000
Montana		133,547.77		133,547.77	36,987	27,767		32,095	6,100	30,600	200,000	3,791,402
Nebraska	41,866.21	201,202.44	112,759.72	355,828.37	61,103	193,448	32,072	13,396	50,483	5,327	3,708,000	3,500,000
Nevada		75,327.59		75,327.59			16,467	21,581	20,638	16,642	650,248	399,442
New Hampshire	20,530.23	651,593.70	332,561.21	1,004,685.14	334,985		593,549	26,484	31,904	17,763	900,000	1,000,000
New Jersey [6]		1,848,932.41	1,860,000.00	3,708,932.41	606,587		2,800,922	87,321	114,696	99,407	5,500,000	3,000,000
New Mexico		527,071.57	487,120.53	1,014,192.10	487,261	96,912	249,284	39,587	6,085	135,063	1,205,000	300,000
New York [1]		9,432,679.00	2,282,452.00	11,715,130.65	5,635,027		4,537,709	1,108,622	273,874	159,899	14,000,000	9,000,000
North Carolina [1]		20,000.00		20,000.00				([4])	20,000		300,000	4,000,000
North Dakota	71,000.00	83,000.00	54,000.00	208,000.00	115,000	28,000	600	29,500	34,900		3,000,000	3,000,000
Ohio	169,075.76	4,670,270.22	3,660,487.75	8,499,833.73	6,272,840	([2])	1,791,244	200,926	133,584	101,239	4,000,000	6,000,000
Oklahoma		1,046,892.75	1,577,610.01	2,624,502.76	998,865	527,422	670,726	168,200	17,512	241,776	1,212,000	507,029
Oregon		2,120,551.24	709,724.79	2,830,276.03	1,948,936	617,388		162,384	63,491	38,076	5,000,000	4,000,000
Pennsylvania	137,437.17	[7] 8,041,833.86	574,605.09	8,753,876.12	1,694,011	279,359	5,473,193	227,335	260,267	[8] 819,711	16,000,000	6,000,000
Rhode Island	34,997.13	745,673.91		780,671.04		109,696	600,720	44,634	10,000	15,622	800,000	355,000
South Carolina	50,754.92	49,238.61	40,911.87	140,905.40	113,921	2,746		[9] 14,022	8,961	1,255	275,000	1,535,334
South Dakota		30,473.35	1,236.18	31,709.53	6,831			14,007	10,871		2,000,000	3,000,000
Tennessee		403,000.00	75,000.00	478,000.00	38,000		400,000	20,000	20,000		1,800,000	2,500,000
Texas	95,510.65	295,567.38	1,934,648.72	2,325,726.75	901,391		1,306,336	85,000	33,000		1,900,000	9,000,000
Utah		1,546,842.53	60,417.72	1,607,260.25	845,929	85,961	231,341	108,892	72,594	262,543	3,000,000	1,163,231
Vermont	5,000.00	778,075.00	223,000.00	1,006,075.00	494,000	55,000	445,000	2,075	10,000		800,000	600,000
Virginia	24,516.57	861,030.69	1,322,804.80	2,208,352.06	1,251,561	138,945	695,537	68,793	51,435	2,082	1,660,000	1,500,000
Washington	128,439.10	2,922,436.11	205,430.45	3,256,305.66	2,520,574	152,576	559,768	([4])	23,388		5,000,000	4,000,000
West Virginia	42,782.17	171,581.32	342,090.76	556,454.25	444,659	72,838	17,758	11,800	9,400		1,290,000	4,500,000
Wisconsin	225,319.00	2,051,455.00	3,307,401.00	5,584,175.00	3,175,126	993,966	1,250,000	([4])	165,083		2,500,000	3,700,000
Wyoming	59,053.61	67,582.26	121,071.74	247,707.61	163,198	17,773		39,146	11,736	15,855	2,000,000	681,507
Total and average	2,108,538.86	66,351,478.24	48,825,251.07	117,285,267.82	57,647,409	12,667,477	34,974,908.	4,596,687	2,512,035	4,887,757	133,670,105	168,812,925

[1] Data for 1917. Data for 1918 not available.
[2] Included under roads.
[3] Does not include San Francisco County.
[4] Included under administration.
[5] Included under engineering.
[6] Approximate.
[7] Does not include $943,765 State funds distributed to townships.
[8] Includes $384,975 for purchase of toll roads.
[9] Includes surveys for approximately 138 miles of proposed construction.

Definite data are not available as to the amount of county, town, district, and other forms of local road bonds which have been voted during the period covered by this investigation. There is, however, abundant evidence that this total far exceeds that already voted by the several states. Many of the state governments, as well as local communities, have also made provisions for considerable increae in their regular road and bridge revenues or have discovered new sources of such revenues. A large number of the states have materially increased the direct road taxes as well as the registration fees of motor vehicles. Three states—Colorado, New Mexico and Oregon—have also placed a tax on the sale of gasoline, the income from which is to be used for road purposes.

Term of Road Bonds

In a few of our states the question of limiting the term of road and bridge bonds to the probable life of the improvement for which they are issued, has as yet received but scant attention. The practice of issuing 30 or 40 or even 50-year bonds to pay for an improvement which cannot possibly last more than one-half and probably not more than one-third or one-fourth of this period, is neither good finance nor good common sense. In no case should the term of these bonds exceed the most probable life or productive period of improvement.

Another practice which has served to cover up this evil is that of taking up road bonds on or before their maturity by means of so-called funding or refunding bonds, which almost invariably have a long term. In this way not only is the term of the debt continued for a very much longer period, but it is placed in such form as to cover or conceal its relation to the road improvement. Consequently, the full extent of the bond burden resulting from our past road and bridge expenditures is impossible of exact determination. Estimates based on the best available data would seem to show that there are at least $400,000,000 outstanding which are actually designated as road or bridge bonds or warrants. These are at present maturing at a rate in excess of $20,000,000 per year and a like or greater amount is required annually for interest payments. For a number of years past new road and bridge bonds have been issued at the rate of about $40,000,000 per annum and while there has been a marked decrease during 1917 and 1918, there is now abundant promise of a very decided increase

TABLE II—Road Mileage

State.	Work done in 1918 under State supervision.			Miles of rural public roads.			State.
	State and State-aid roads built, 1918.	Roads maintained with State aid, 1918.	Number of bridges built by State or State aid, 1918	Total all surfaced roads in State (approximate).	Total all public rural roads in State.	Percentage of surfaced roads in State.	
Alabama	[1]109		2	6,125	55,446	11.0	Alabama.
Arizona	52	436	10	475	12,075	3.9	Arizona.
Arkansas	(2)		(2)	2,000	50,743	4.0	Arkansas.
California	[3]260	2,521	11	13,000	61,039	21.2	California.
Colorado	[4]100	7,000	15	2,550	39,780	6.4	Colorado.
Connecticut	[5]55	1,481	13	3,200	14,061	22.6	Connecticut.
Delaware	10	20	1	310	3,674	8.5	Delaware.
Florida	[6]77	362	1	3,900	17,995	21.6	Florida.
Georgia	17		2	13,200	80,669	16.4	Georgia.
Idaho	[7]90	490	12	850	24,396	3.5	Idaho.
Illinois	[8]232	736	80	12,800	95,647	13.4	Illinois.
Indiana				31,000	73,347	42.5	Indiana.
Iowa	[9]2,969	104,082	[10]10,237	1,500	104,074	1.4	Iowa.
Kansas	19		(2)	1,550	111,052	1.4	Kansas.
Kentucky	[11]214	65	150	13,900	57,916	24.0	Kentucky
Louisiana	(2)	(2)	(2)	2,700	24,563	11.0	Louisiana.
Maine	[12]160	4,235	19	3,525	23,537	14.9	Maine.
Maryland	192	1,433	5	3,100	16,459	18.8	Maryland.
Massachusetts	72	[13]2,000	1	9,100	18,681	48.8	Massachusetts.
Michigan	150			10,600	74,190	14.3	Michigan.
Minnesota	[14]1,643	12,089	[10]640	7,000	93,517	7.5	Minnesota.
Mississippi				2,700	45,779	5.9	Mississippi.
Missouri	[15]300	[16]11,400		7,550	96,041	7.8	Missouri.
Montana	[17]83		9	900	39,204	2.3	Montana.
Nebraska	[18]41		6	1,450	80,272	1.8	Nebraska.
Nevada		260		340	12,182	2.8	Nevada.
New Hampshire	[19]52	1,479		2,000	14,020	14.5	New Hampshire.
New Jersey	16	2,450		6,050	14,817	41.0	New Jersey.
New Mexico	[20]1,268	6,035	163	620	[21]43,091	1.4	New Mexico.
New York	(2)	(2)	(2)	18,400	79,398	23.2	New York.
North Carolina	(2)	(2)	(2)	6,850	50,758	13.5	North Carolina.
North Dakota	[22]110	65		1,160	68,796	1.8	North Dakota.
Ohio	[23]342	2,485	7	31,800	86,354	36.8	Ohio.
Oklahoma	[24]927	2,592	614	700	107,916	.7	Oklahoma.
Oregon	[25]213		60	5,000	36,819	14.1	Oregon.
Pennsylvania	44	8,495	167	10,600	91,556	11.6	Pennsylvania.
Rhode Island	[26]15	325	12	750	2,170	34.5	Rhode Island.
South Carolina	11		1	3,800	42,226	9.0	South Carolina.
South Dakota	(2)			800	96,306	.8	South Dakota.
Tennessee	12	3,800		8,880	46,050	19.2	Tennessee.
Texas	200	13,000		12,300	128,960	9.6	Texas.
Utah	109	367		1,650	8,810	18.6	Utah.
Vermont	110	4,300		2,300	14,249	16.3	Vermont.
Virginia	[27]358	3,054	39	6,150	53,388	11.7	Virginia.
Washington	[28]275	1,411	6	6,300	42,428	14.9	Washington.
West Virginia	[29]135	88	12	1,600	32,024	5.0	West Virginia.
Wisconsin	[30]735	5,000	670	15,500	77,280	20.1	Wisconsin.
Wyoming	[31]167		8	600	14,797	4.1	Wyoming.
Total and average	11,944	203,556	12,973	299,135	2,478,552	12.0	Total and average.

[1] Includes 12 miles of earth roads.
[2] Data not available.
[3] Includes 87 miles of earth roads.
[4] Includes 64 miles of earth roads.
[5] Includes 34 miles of reconstruction.
[6] Includes 5 miles of earth roads.
[7] Includes 75 miles of earth roads.
[8] Includes 64 miles of earth roads.
[9] Includes 2,549 miles of earth roads.
[10] Includes culverts.
[11] Includes 45 miles of earth roads.
[12] Includes 5 miles of earth roads.
[13] Includes about 792 miles of town roads.
[14] Includes 1,207 miles of earth roads.
[15] Includes 245 miles of earth roads; does not include 200 miles partially completed.
[16] Dragging only.
[17] Includes 32 miles of earth roads.
[18] Includes 36 miles of earth roads.
[19] Includes 9 miles of reconstruction.
[20] Includes 1,063 miles of earth roads.
[21] As reported by State highway engineer May, 1919.
[22] Includes 100 miles of earth road.
[23] Includes 22 miles of earth roads.
[24] Includes 716 miles of earth roads.
[25] Includes 100 miles of earth roads.
[26] All reconstruction.
[27] Includes 44 miles of earth roads and 52 miles of reconstruction.
[28] Includes 140 miles of earth roads.
[29] Includes 111 miles of earth roads.
[30] Includes 373 miles of earth roads.
[31] Includes 144 miles of earth roads.

Streets Cost about $300,000,000

The expenditures on our city, town, and village streets are not included in these compilations as no complete records are available as to their amount However, it is estimated that the expenditures on account of our streets amount in round numbers to $300,000,000 annually, or approximately the same as that expended on our rural roads and bridges. Many of our city streets are in reality only extension or connecting links in our main highway systems. With the present tremendous development of motor trucks and automobile traffic these streets become an important and vital factor in the efficient operation and functioning of our general highway system, and especially to any general plan of motor hauling involving the delivery of country produce. It is, therefore, hoped that more definite data in regard to the extent, cost, and conditions of our city streets may soon be available.

Average Increase Shrinks

The abnormal conditions during 1917 and 1918 had a very decided effect on road and bridge work. From 1904 to 1916 the average annual increase in the total rural road and bridge expenditures was about 10% over and above those of each previous year. During the years 1917 and 1918, however, this increase was reduced to about 2½%. The part which the several states pay in comparison with that of local subdivisions, on the contrary, has continued to increase at a uniformly rapid rate. In 1904 eleven state highway departments expended a total of $2,550,000 for road and bridge work, and in 1914, thirty-one state highway departments expended $4,221,000. In 1917, every state in the Union participated and the total expenditure of the state funds amounted to $47,291,000. In 1918, this had reached a total of $66,351,000.

The utilization of convict labor in road work or in the preparation of road materials under competent state supervision is coming to be a more and more important factor, while the employment of statute labor or working out of poll taxes is steadily decreasing from year to year At the present time in more than one-half of our states the use of convict labor has definitely passed the experimental stage and has been established as a success.

TABLE III—Cash Road and Bridge Expenditures for Calendar Years 1904, 1914, 1916, 1917 and 1918

State	Year in which first State-aid law passed.	State funds expended by or under State highway department.					Total cash expenditure from all sources (approximate).				
		1904	1914	1916	1917	1918	1904	1914	1916	1917	1918
Alabama	1911		$170,232	$102,422	$89,511	$103,285	$378,040	$3,949,019	$4,186,384	$2,669,022	$2,371,213
Arizona	[illegible]			441,202	543,422	975,802	67,591	982,721	1,988,221	1,569,422	2,017,749
Arkansas	1913		115,000	55,483	80,262	221,831	681,934	1,522,696	3,443,887	3,335,262	1,963,610
California	1895	$11,251		4,285,964	3,058,030	6,941,192	2,157,396	19,171,985	20,392,434	18,245,200	21,646,638
Colorado	1909		301,274	607,628	703,000	800,000	635,395	1,937,546	2,313,208	2,570,000	3,300,000
Connecticut	1895	219.165	1,307,381	1,865,948	2,197,264	3,172,706	1,195,125	3,640,963	3,200,948	4,004,225	5,018,820
Delaware	1903	14,000	31,000	31,000	21,600	429,734	90,803	511,628	512,000	321,600	943,377
Florida	1915			10 484	23,797	179.807	437,184	2,280,255	4,010,484	6,384,797	5,764,205
Georgia	1908				1,910	15,000	894,936	3,688,172	3,750,000	4,318,350	5,792,056
Idaho	1905		49,812	100,057	473,132	491,342	201,648	1,371,469	1,948,118	2,092,723	3,519.920
Illinois	1905		387,989	1,119,202	1,258,338	860,911	3,844,424	8,734,713	10,356,669	10,083,728	10,183,353
Indiana	1917				14,000		3,438,389	14,233,986	13,500,000	14,014,000	13,000,000
Iowa	1904		74,000	90,821	89,787	113,488	2,344,107	10,187,507	14,427,877	15,625,406	14,549,622
Kansas	1911		9.080	10,000	10,000	25,000	692,823	5,544,048	5,610,000	6,010,000	5,017,117
Kentucky[1]	1912		18,000	708,346	1,501,650	1,000,000	1,161,194	2,474,621	4,448,533	4,923,651	3,380,000
Louisiana	1910		161,186	184,533	182,295	182,295	345,452	1,777,572	3,458,643	3,540,976	3,540,976
Maine	1901	41,885	467.149	1,055,250	1,112,675	1,570,494	1,472,393	2,042,007	3,167,215	3,244,982	3,859,415
Maryland	1898		356,845	2,280,000	2,804,707	2,681.142	873,471	6,000,052	5,560,000	6,083,682	5,750,135
Massachusetts	1892	575,606	242,560	2,701,236	4,231,802	3,522,194	2,871,222	6,091,875	6,499,141	9,494,802	9,124,303
Michigan[1]	1905		657,264	982,939	1,704,359	1,704,359	1,816,504	9,261,998	10,082,939	11,190,153	10,673,153
Minnesota	1905		1,309,956	1,390,525	1,429,865	1,870,336	1,607,417	6,458,940	8,742,278	8,024,760	10,567,711
Mississippi	1915			6,500	6,500	10,000	339,669	3,960,377	3,256,500	3,256,500	760,000
Missouri	1907		277,253	482,860	367,913	704,400	1,570,801	5,513,049	7,982,860	7,374,933	7,154,400
Montana	1913		13,516	26,150	25,729	133,548	308,744	2,888,400	3,475,569	3,356,869	3,924,950
Nebraska	1911			110,000	9,500	201,202	494,886	1,796,278	4,500,000	4,603,400	3,855,828
Nevada	1911				36,796	75,328	46,876	245,014	275,000	336,796	474,770
New Hampshire	1903	44,000	491,520	414,669	589,254	651,594	872,606	1,590,464	2,045,410	2,238,705	2,004,685
New Jersey	1891	250,000	1,306,596	1,167,843	1,501,902	1,848,932	3,274,811	7,208,287	5,784,354	6,280,897	6,708,922
New Mexico	1909		115,732	385,684	280,578	527,072	35,458	556,399	828,952	845,867	1,314,192
New York[1]	[illegible]	1,056,460	8,544,126	9,409,655	9,432,679	9,432,679	3,937,739	23,231,964	19,901,391	21,685,131	20,715,131
North Carolina[1]	1901		5,000	10,000	20,000	20,000	624,381	5,215,491	5,510,000	5,520,000	4,020,000
North Dakota	1909				28,638		456,130	2,402,384	2,711,295	2,867,979	3,208,000
Ohio	1904		1,855,338	2,885,071	2,835,649	83,000	4,776,318	14,334.246	12,992,625	12,017,104	14,499,834
Oklahoma	1911			300,000	286,922	4,670,270	447,320	2,112,681	3,625,000	3,722,355	3,131,532
Oregon	1913		10,697	165,662	711,000	1,046,893	649,718	5,310,467	5,955,662	5,711,000	6,830,276
Pennsylvania	1903	127,767	1,976,768	3,663,352	4,351,566	2,120,551	4,887,266	10,424,580	10,985,392	11,463,333	14,753,876
Rhode Island	1902	79 397		543,152	486,725	8,041,834	376,812	446,496	943,152	861,725	1,135,671
South Carolina	1917				27,161	745,674	334,082	1,024,480	1,250,000	1,277,161	1,676,239
South Dakota	1911				5,000	49,239	268,723	1,217,809	2,708,000	2,755,000	3,031,710
Tennessee	1915			200,000	231,500	30,473	629,141	2,370,560	4,600,000	2,481,500	2,978,000
Texas	1917				10,000	403,000	2,543,613	9,920,079	10,500,000	10,010,000	11,325,727
Utah	[illegible]		157,732	179,400	120,200	295,567	158,286	803,071	1,855,160	1,893,129	2,770,491
Vermont	1898	127,381	458,456	632,800	578,883	1,546,843	567,397	1,023,941	1,607,800	1,680,489	1,606,075
Virginia	1906		523.578	542,524	695,171	778,075	687,751	3,224,529	3,691,249	4,136,779	3,708,352
Washington	1905		1,343,431	859,672	2,031,392	861,031	1,344,842	7,944,717	7,518,343	7,115,691	7,256,306
West Virginia	[illegible]			10,967		2,922,436	587,870	2,483,747	5,510,967	8,200,000	5,056,454
Wisconsin	1911		1,482,379	950,000	1,050,888	171,581	1,924,026	9,880,240	10,570,764	9,886,554	9,284,175
Wyoming	1911				37,845	2,051,455 67,582	74,476	669,661	450,000	589,691	929,215
Total		2,549,850	24,220,850	40,969,001	47,290,796	66,351,478	59,427,180	240,263,784	272,634,424	279,915,332	286,098,113

[1] Data for 1918 not available; state expenditures shown in 1918 column are for the year 1917

Centralizing Control of Work

One of the most notable features in the development of our road and bridge work is the increase in the amount of funds expended for road maintenance under the supervision and control of the several state highway departments. In 1914 the several state highway departments directed the expenditure of $16,343,000 for maintenance. In 1917 this had increased to $27,649,000, while in 1918 it reached a total of $34,974,908. This increase is in part due to the heavier traffic and the rising prices of labor and materials, but more largely to the growing tendency to centralize the control of all our important highway work under competent state control and supervision.

While highway construction during the year 1918 was considerably curtailed, especially by the local subdivisions, extraordinary traffic development required a large amount of improvement and reconstruction of a quite substantial nature. The reason for these construction demands is readily apparent. At the present time approximately 6,000,000 motor vehicles, of which about 10% are motor trucks and other commercial vehicles, are used on our public roads and streets. If each of these vehicles averaged only 5,000 mi a year, which is certainly a low estimate, the total traffic of all our motor vehicles would amount to approximately 30,000,000,000 vehicle-miles per year. Furthermore, it is a well known fact that at least 75% of the total traffic is concentrated on about 20% of our rural public roads Consequently, the reason why our roads are requiring so much greater expense and effort for adequate maintenance is readily apparent. This motor traffic, furthermore, has grown up almost entirely within the past 15 or 18 years and is entirely in addition to the horse-drawn vehicle-traffic which, with the exception of that of pleasure vehicles, is probably as large as ever. At the present time the horse-drawn traffic on most of our roads forms less than 10% of the total.

(CONTINUED ON PAGE 176)

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS Editor
T. A. HULBERT Managing Editor

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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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ROAD WORK IN 1918

In spite of war-time restrictions on road building, the expenditures for road and bridge work in the United States continued to increase during the two years of the war, 1917 and 1918, though the annual rate of increase amounted to only about 2.5% as compared with a normal of about 10%. This is the outstanding feature of the statistics on road expenditures in 1918, given in the first article of this issue.

The totals for road work and for city street work are also noteworthy, for they give some idea of the great and growing importance of the work that is being done in the betterment of the country's transportation facilities. A grand total of $600,000,000—$300,000,000 for rural roads and $300,000,000 for city streets—is an impressive figure, even in these days of huge expenditures, for while measured by the nation's total mileage of rural roads, $300,000,000 is only about $120 a mile, in terms of the 20% of that mileage that carries from 75 to 80% of the traffic it is nearly $600 a mile. And it must be remembered that in all probability the expenditures of the current year and those of 1920 will exceed those of 1918 by considerably more than the normal increase. As is pointed out in the article to which reference has been made, large bond issues have been voted, others are likely to be authorized, and unusual apprornpriations have been made. There has been a new awakening to the necessity of road improvement, and there is every reason to believe that the country is at the threshold of a road building era that will bring greater activity that has ever been known.

Much of the new impetus that has been given to the betterment of the rural roads is attributable to the tremendous increase in motor traffic to which the article directs attention. This is a by-product of the war, but it is something that will be permanent and that will have to be reckoned with in the future. It has brought some new problems and emphasized some old ones, but they are fast being solved by road builders. The questions remaining are largely those of financing road work and of legislation for the regulation of traffic.

ROAD BUILDERS AND THE GENERAL PUBLIC

The relation between the road builder and the general public has always been a subject of more than passing interest. It is quite generally conceded that the road builder—like the engineer in other branches—takes too little active interest in public affairs and does not put himself and his work forward to the same extent as do members of other professions. It is probably because of this that the road builder and his work are less appreciated than they should be; it is certain that his failure to develop and use his influence results in a real loss to society.

The reason for this condition can not be found in the nature of the road builder's work, for the public is more interested in it than almost any other work that engineers perform. The condition of the roads and streets is a matter of some concern to everyone, and of very direct interest to many because of the ever increasing number of motorists. The result is that road building is the subject of lay discussion more frequently than is engineering of almost any other kind.

Becaue this is so, it is particularly desirable that the public should be given reliable information about road work. It is not necessary, of course, that the taxpayer shoud know how to build roads, but it is desirable that he should know enough about the economic phases of road improvement so that he can act intelligently at the polls and will realize the necessity of putting road work in charge of trained men.

If the average taxpayer knew more about roads and road buiding, less money probably would be spent injudiciously. The task of informing the public is distinctly one for the engineer, for he is the best fitted to do it. His task is always to carry on the work intrusted to him in such a way as to make it produce the maximum return on the money invested. If he is a competent engineer he knows what methods will achieve that result and it is his duty, as a citizen as well as an engineer, to see that those methods are adopted. He can do this only by exerting all the influence he has in rightly molding public opinion.

TRADE LITERATURE

With the growth of motor traffic over the country's highways and the advances in the science and art of road building induced by the demands of that traffic, there has come a corresponding development of road building machinery and equipment. The road builder who wants to be abreast of the times must not only keep himself informed of new methods but must also familiarize himself with new plant and with improvements in the equipment he is already acquainted with.

Engineers in all branches depend to a large extent upon technical journals for data on methods and also upon machines and tools. But for various reasons—chief among them being lack of space—the engineering periodical can not give, in the text pages at least, all the information on machinery that the up-to-date road builder needs to have.

Much of this information can be found in the advertising pages of periodicals. The rest must be obtained from the catalogs and other printed matter usually classed as "trade literature", that is gotten out by manufacturers and that is noted in the reading pages—in "Good Roads", for instance, under the heading "Equipment—Trade—Materials."

In many engineering organizations, such as the engineering departments of large industrial plants, trade literature forms a very considerable portion of the working library, and fequently some manufacturer's catalog or handbook is the most used volume in it. Any engineer in active practice will find that almost all of the printed matter gotten out by concerns handling materials or machinery used in his line of work contains data that he has frequent occasion to use.

While some highway engineers make the best possible use of this source of information, it is doubtful if the majority of engineers do utilize it as much as they might. Those who do not will find it greatly to their advantage to they are doing and to form the habit of turning to that source for data.

Highway Expenditures in the Year of 1918

(Concluded from Page 174)

Traffic Too Heavy for Many Roads

The public roads of the United States at the present time have a total length of 2,478,552 mi., of which about 299,135 are improved with some form of surfacing. A large portion of this mileage, however, is comprised of sand-clay, gravel, or water-bound macadam, much of which is proving entirely inadequate for the present-day traffic and is rapidly deteriorating. During 1918 there was improved by the several state highway departments a total of 11,944 mi., of which about 7,000 consisted of grading, most of which was preparatory to later surfacing. In addition to this construction, the several state highway departments also supervised the maintenance of 203,556 mi., most of which were main and trunk line highways.

The expenditures for 1918 by or under the various state highway departments are shown in Table I and the work accomplished is shown in Table II. Table III shows the expenditures from purely state funds for the years 1904, 1914, 1916, 1917 and 1918, and also the total combined state and local expenditures for the same years. In Table I the columns under "administration" and "engineering" show a considerable variation in the percentage devoted to these purposes in each of the several states. These variations are probably due more to difference in bookkeeping and definition as to what items should be included under these heads than any other cause. There is a great need for common standards in regard to these items so that such expenditures may be fairly comparable as between the several states. This also applies to the term "reconstruction" and "maintenance." In some states practically all reconstruction work is classed under maintenance, while in others it is classed entirely under construction and in still others it is kept as a separate item and designated as reconstruction.

These compilations include no expenditures for road or street work by the War or Navy Department and similar agencies in or at cantonments, training stations, or other places.

Road Improvement Program of Tarrant County, Texas

The highway authorities of Tarrant County, Texas, are working out a program for extensive highway improvement, involving a total expenditure of $3,450,000, the funds for which were provided by a recent bond election.

The county already has a system of eight roads from Forth Worth to the county line, and the new roads it is proposed to build, will comprise the construction of connecting links between these main highways. According to present plans, the completion of the work will mean that every school and church in the county will be provided with a good road. About $450,000 of the total is to be spent on the construction of concrete bridges and culverts. The work will be done by state and federal aid, and maintenance will be taken care of with the proceeds from automobile registrations.

Graduate Courses in Highway Engineering at the University of Michigan.

An announcement of the plans for conducting graduate and undergraduate work in highway enginering at the University of Michigan has recently been made. As noted in previous issues, this work is in charge of Prof. Arthur H. Blanchard, formerly of Columbia University, and will comprise not only the subjects ordinarily included in highway engineering courses, but also considerable special work in highway transportation.

The graduate courses are intended especially for men engaged in highway work, and will be given during the months of December to March, inclusive. The course will lead to the degree of Master of Science in Engineering, and will be open to graduae engineers and to others who do not hold collegiate or technical degrees, but who "give evidence of fulfilling the prerequisites of the given course." The latter cannot be candidates for a degree, but will be accepted as special students. During the year 1919-1920 four courses will be given and during the next year enough short period courses will be added to cover the requisite amount of graduate work for the master's degree.

The four courses to be given during the coming college year cover highway transport, bituminous surfaces and bituminous pavements, highway laboratory research, and highway bridges. The course in highway transport will include lectures, discussions, reading and field investigations, and will cover the history and development of transportation in the United States and England, the inter-relationship of highway, railway and waterway transportation, American highway traffic legislation and other subjects. The course in bituminous surfaces and bituminous pavements will consist of lectures, discussions, reading and inspection trips. The course in highway laboratory research will include, besides laboratory work, lectures, discussions, reading and field investigations. The course in highway bridges will consist of lectures, discussions reading, design and field inspections, and will cover wood, steel, and plain and reinforced concrete structures.

In addition to this graduate work, a short course in highway engineering will be given during the year. The work will be undertaken with special reference to conditons and problems in Michigan and will consist largely of lectures. It will be given at a time when local highway authorities can attend, the date to be announced later.

A highway transport conference, lasting a week, will also be held during the collegiate year of 1919-1920.

EQUIPMENT—TRADE—MATERIALS

Labor Saving Machinery Utilized by Minnesota Contractor

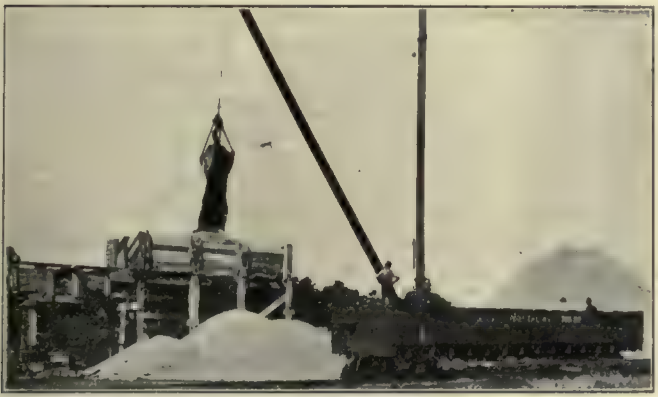
Industrial Track and Cars with Loading and Mixing Equipment Reduce Cost on Concrete Pavement Job in Anoka County.

In a recent contract for the construction of about 6½ mi. of 18-ft. concrete pavement near Dayton, Minn., the existing conditions were such that the contractor decided to use machinery wherever practicable. The considerations that led to this decision were as follows: First, the grades were fairly easy, the maximum being 2.75%; second, the cost of teams was high and it was impossible to depend upon having them when wanted; and, third, the supply of labor was limited.

The plant used by the contractor comprised a storage plant at a railroad siding in Dayton, a narrow gauge industrial track with the requisite rolling stock, a mixer loader and a concrete mixer. The storage plant, which was situated at about the middle of the job, consisted of a derrick with a 50-ft. mast and 60-ft. boom, a hopper for aggregates and a cement shed. The industrial railroad from the storage plant to the work was laid along the center of the completed subgrade. The aggregate and cement were piled along the sides of the track as needed, after which the track was taken up to allow the mixer loader to travel along the place occupied by the track between the material piles.

The mixer loader used, which is shown in one of the accompanying illustrations, consists of a belt conveyer operating upon a steel frame carrying measuring hoppers which may be set to the required capacity for the mixture being used. Materials were shoveled from the piles into the hoppers, which are fitted with doors at the bottom, allowing the materials thrown out upon the belt to be discharged into the loading skip of the mixer, as shown in the illustration.

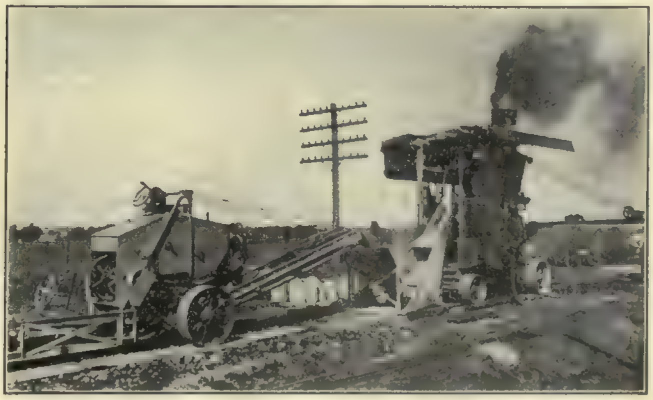
Both the mixer loader and the mixer were manufactured by the Koehring Machine Co., of Milwaukee, Wis. The work was done by the Widell Construction Co., of Mankato, Minn.



Material storage at Siding

Material Piles Along Track

Industrial Railway Along the Job



Mixer Loader and Mixer

LABOR SAVING MACHINERY IN USE ON A ROAD JOB

Packard Factory Addition

The Packard Motor Car Co. has commenced work upon a substantial addition to its factory, which will permit both an increase in output and a more uniform production of the various sizes of trucks it builds. The building and its equipment entails an investment of over $1,750,000. It will be a 3-story building of standard factory construction and will add 250,000 sq. ft. of floor space to the present factory area of about 60 acres'

It is stated that with the better facilities it will have upon the completion of the addition, the company will be able to turn out three sizes of trucks simultaneously.

MEETINGS

Calendar of Comings

Nov. 12-14—American Society of Municipal Improvements.—Annual convention, New Orleans, La. Secretary, Charles Carroll Brown, 304 East Walnut St., Bloomington, Ill.

Jan. 15-16, 1920.—Southern Appalachian Good Roads Association.—Tenth Annual Meeting, Asheville, N C. President, A. D. Williams, Parkersburg, W. Va.

Feb. 9-13, 1920—American Road Builder's Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Apr. 12-17, 1920—United States Good Roads Association.—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Apr. 16-17, 1920—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

American Road Builders' Association

The annual meeting of the Association will be held at the Automobile Club of America, 247 West 54th Street, New York, N. Y., Nov. 7, 1919. There will be both a morning and afternoon session. It is expected that there will be a large attendance of members and others interested in the subject of highway improvement. Everybody will be cordially welcome. The program is arranged as follows:

9:30 A. M. Meeting of Board of Directors

MORNING SESSION.

10:30 A. M., Assembly Hall.

Report of Committee on "Uniform Highway Signs." Chairman, Robert A. Meeker, Consulting Engineer, Newark, N. J.

Report of Committee on "Convict Labor on Highway Work: Organization, Administration, Camps and Cost Data," Chairman, G. P. Coleman, State Highway Commissioner of Virginia.

Report of Committee on "Sources of Supply of Unskilled Labor for Highway Work." Chairman, Paul D. Sargent, Chief Engineer, Maine State Highway Commission.

Report of Committee on "Civil Service Requirements for Highway Engineering Positions." Chairman, H. G. Shirley, Secretary, Highway Industries Association and Federal Highway Council.

LUNCHEON.

Luncheon will be served in the Grill Room of the Club at 1:00 P. M. All are cordially invited to attend. Acceptances should be sent to the Secretary, 150 Nassau St., New York City.

AFTERNOON SESSION.

2:30 P. M., Assembly Hall

Report of Committee on "Economic Status of Guarantees for Pavements on Roads and Streets." Chairman, Francis P. Smith, Consulting Paving Engineer, New York City.

Report of Committee on "Methods of Strengthening and Reconstructing Highway Bridges for Heavy Motor Truck Traffic." Chairman, Willis Whited, Bridge Engineer, Pennsylvania State Highway Department.

Report of Committee on "Reconstruction of Narrow Roadways of Trunk Highways with Adequate Foundations and Widths for Motor Truck Traffic." Chairman, H. E. Breed, Consulting Engineer, New York City.

Discussion of the following resolution:

Resolved: That Federal-Aid funds should be used only for the construction of trunk line roads and bridges of adequate width and strength. Discussion opened by Nelson P. Lewis, Chief Engineer, Board of Estimate and Apportionment of New York City.

Annual Report of Secretary.

Annual Report of Treasurer.

Annual Report of Board of Directors.

Amendments to the Constitution and By-Laws.

Report of Committee of Tellers relative to Election of Officers for 1919-1920.

Address by the President-Elect.

Adjournment.

North Atlantic Division of National Highway Traffic Association.

A public meeting of the North Atlantic Division of the National Highway Traffic Association will be held in the grill room of the Automobile Club of America, 247 West 54th Street, New York, N. Y., on Friday, November 7, the dinner being at 6:30 p. m., and the eveinng's program beginning at 8:00. Dinner reservations should be addressed to the Secretary, Elmer Thompson, 247 W. 54th St., New York City.

The addresses to be made are as follows: "Present Status of Impact Tests on Roadway Surfaces," by A. T. Goldbeck, Testing Engineer, United States Bureau of Public Roads; "Motor Vehicle Traffic which Requires the Use of Cement-Concrete Foundations," by W. G. Thompson, State Highway Engineer of New Jersey; "Relation of the Motor Truck to the Railroad," by C. W. Reid, Manager, Transportation Bureau, Federal Highway Council. Progress report of committee on "Sign Posting for Detours and Through Routes in Municipalities" will be submitted by Chairman Elmer Thompson, Secretary of Automobile Club of America.

Personal Mention

O. W. Lee, of Benjamin, Texas, has been appointed engineer of Knox County, Texas.

A. C. Pancost, of Beeville, Texas, has been appointed engineer for Road District No. 5 in San Patricio County.

A. T. Dickey, City Engineer of Galveston, Texas, for a number of years, has been employed by the Nagle-Witt-Rollins Engineering Co., to manage a job in Potter Cunty, Texas.

Fred P. Holt, of Mexia, Texas, has been appointed engineer of the Mexia, Prarie Hill, Cooledge, Shiloh, Forest Glade and Thelma Road Districts in Limestone County, Texas. Bonds amounting to $515,000 have been voted in these districts.

H. N. Roberts, of Tulsa, Okla., has been retained by the City of Henderson, Texas, to construct 15,000 sq. yd. of vertical fiber brick paving. He has also been retained by the City of Longview to construct 20,000 sq. yd. of the same type of pavement.

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

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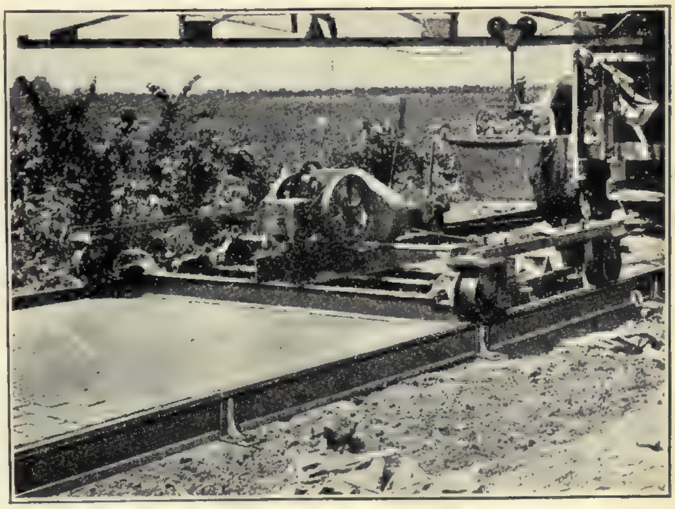

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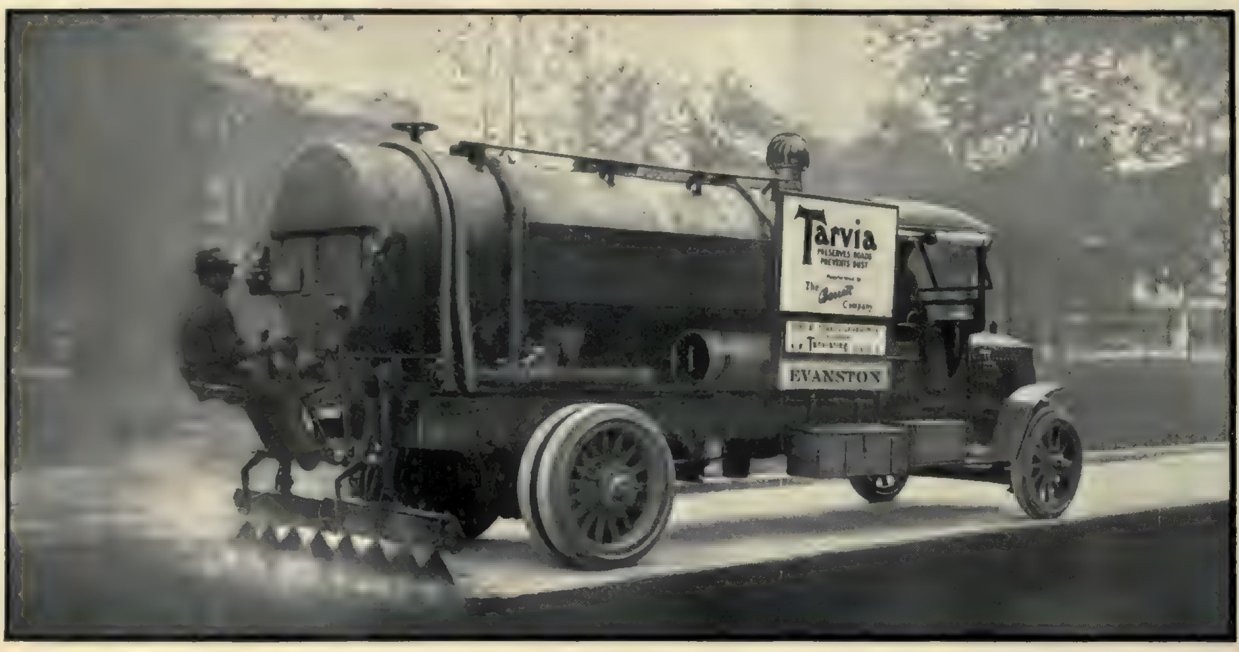

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GOOD ROADS

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WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series. Vol. LVII.
New Series, Vol. XVIII

NEW YORK, OCTOBER 15, 1919

Number
16

Constructing Pavements by Halves*

A Discussion of the Construction Details Governing the Work of Laying Various Types of Hard-Surfaced Pavements by Halves

By W. L. HEMPELMANN †

There comes a time in the construction experience of every contractor, superintendent or engineer when necessity, economy or other important reason seems to point to the construction of half a pavement wearing surface at a time. In the less expensive and less permanent matter of road oiling, practically everyone has found it necessary at various times to oil half the roadway to avoid interference with the traffic any more than absolutely necessary. This procedure particularly obtains in rural or county work where the closing of a road to traffic for only 24 or 48 hours would entail a wide detour by the users during that period as well as a hardship to the regular commercial traffic, resulting in financial loss to the merchant as well as inconvenience to his customers. The method of handling such road oiling operations is known to all.

Laying Half of Width While Maintaining Traffic on Other Half

Resurfacing with Texaco Asphaltic Concrete—Half Width Method

HALF-WIDTH PAVEMENT CONSTRUCTION ON MICHIGAN AVE. CHICAGO, ILL.

When the more permanent types of construction, such as sheet asphalt, asphaltic concrete, cement grouted brick and Portland cement concrete are considered, other and more important features than those mentioned above must be given serious consideration. In new work or on county highways where concrete base is to be considered, it is usually found possible to parallel such construction with a temporary roadway, so that the necessary time for the proper "setting up" of the concrete base can be had without disturbance of that base during such period. In times gones by, certain engineers and communities, for various reasons, undertook to include in such base an allowance for expansion or movement by providing so-called concrete base expansion joints. Experience soon demonstrated that this was a mistake and resulted in a non-support of the definite area of the wearing surface over the width of such joints, the result in each case being a crack immediately above such joints after a period of a year or more.

In the main, and in the more congested communities, the important highways will have to be constructed. And if, at the time the work is done, proper consideration is given to the future, only the wearing surface proper will have to be replaced. Let us consider just what can be done with the four types of construction mentioned above, taken in the reverse order:

---

*Engineer, Middle Western Division, Asphalt Sales Department, The Texas Company.

I think it will be admitted that because of the slab action in the concrete pavement of the usual mix and thickness, an area of 30x30 ft. approaches the maximum unit area for such construction. This does not mean that such blocks of concrete in place will not crack subsequently. Usually, in those concrete pavements less than 30 ft. in width where expansion joints are to be used, it has been the practice to place such joints every 25 or 30 ft. In many cases, as a result of their experience that irrespective of expansion joints concrete pavements will crack, some engineers have concluded to construct such pavements without any joints, seemingly concluding that cracks will come whether expansion joints are used or not and that when they do appear an attempt will be made to maintain them in satisfactory shape by filling with some adhesive bitumen.

It is practically impossible to join one day's concrete to the previous day's work so that the joint will become an integral part of the construction. Sometimes adjoining concrete sections are tied together by metal strips or other reinforcement, and where joints are used, of course the day's work is finished at an expansion joint.

Obviously, for concrete pavements of 40 or 50 ft. in width, it becomes necessary to use a joint of some kind at some point near the crown. I think all concrete pavement advocates will admit that the less edge exposed the better. It is very evident what a longitudinal joint means, both in exposing two additional edges to wear under traffic, as well as in dividing the paving area longitudinally, and so making it possible for settlement of the subgrade or frost action in the spring to throw out of line the adjacent concrete sections. Again, I think it will be admitted that the cement interests wou'd not sanction the use of a black bituminous material—definitely showing up every crack in which it is used—had they been able to furnish either an inorganic commercial material allied with the cement industry which could be successfully used in its stead, or other means that would not so clearly emphasize defects in the concrete pavement wearing surface.

Again, templates on guides at the edge of construction are used in the main to obtain the proper contour of such wearing surface. I think it can be seen, therefore, that many serious difficulties as well as uncertain results would be encountered by attempting to construct half the width of a concrete pavement at a time.

The chemical and physical reactions of the cement during the "setting up" period are not definitely known. Attempts to join new concrete to old have invariably resulted in a weak section at the juncture—another reason why it is not deemed advisable to attempt such construction at the crown of any pavement.

Without going into detail, and because the analysis is very similar to that for the cement concrete pavement, I think it will be appreciated that a cement grouted brick pavement cannot profitably, nor with any degree of certainty, be laid half the width at a time. It is most desirab'e in the grouted brick pavement to apply the grout as uniformly and as quickly as possible so that the whole mass may set up together. A moment's reflection will indicate many points to be considered were an attempt to be made to grout half the width of a brick pavement, wait at least ten days or two weeks, and then attempt to grout the other half, and be at all certain of the results.

Bituminous fillers could be more satisfactorily used in the construction of brick pavements, but would present certain objections which would have to be carefully considered in the construction of such pavements half at a time.

On the other hand, hot asphaltic types of wearing surface construction can be and have been successfully laid by resurfacing or constructing over a proper base one-half the width of the pavement, the other half carrying the traffic in the meantime.

Where a concrete base is in place, or an old brick, macadam or other pavement is to be resurfaced, it has now become the universal custom to dump the hot wearing surface material outside of the area it is to occupy in the street, making it necessary to shovel all such material into place and thereby adding considerably to the uniform distribution of such wearing surface material. Where it is possible, bituminous wearing surface material is generally raked longitudinally with the pavement and from curb to curb. In a resurfacing job, particularly where the roadway is an important one, it has frequently been necessary to keep the roadway open to traffic during reconstruction. The procedure in such case is to shut off or barricade one-half of the width of the pavement and dump, rake and roll the wearing surface material in such area, keeping the heavy roller at least 12 or 18 in. from the loose raked edge of the bituminous material. When it becomes necessary to apply the wearing surface to the remaining half, the usual practice is to pile the new hot wearing surface material completely over the unrolled area of the completed pavement. Sufficient time is allowed for the new material to heat and soften such area and then the material at the joint is raked to grade with the rest of the pavement. The joint and the new pavement are then rolled in the usual way, insuring an absolute bond and uniform construction, partly because the material at the joint receives no compression until that particular section of the pavement is completed. The fact that we are dealing with a bituminous material makes this procedure possible, since the higher temperature of the more recently applied wearing surface causes an absolute bond and amalgamation with the material previously put down. Such joint would be no weaker in construction than the regular joint made in bituminous sheet construction, employing either the feather-edge or joint strip method.

A specific example of the efficacy of this type of construction is a section of Texaco asphaltic concrete laid in 1912 on Michigan Boulevard, south of 16th St., in Chicago, Ill. This was a resurfacing job, and when the old wearing surface was removed there was revealed a very irregular natural cement foundation surface. This was due largely to the number of excavations and trenches that had been made in the old pavement at various times. To this uneven foundation was applied a Texaco asphaltic concrete binder sufficient in thickness to bring the surface to the proper grade and elevation and 2 in. below the intended surface of the finished pavement. Two inches of Texaco asphaltic concrete wearing surface was then applied to half the roadway while traffic was permitted on the other half. That this type of construction can be used to produce satisfactory results is evident from this section which is now in its seventh year and which has carried 17,000 to 20,000 vehicles per day since its construction without any expenditure for maintenance.

———ooo———

According to Reports from Findlay, Ohio, the old roadbed of the Findlay, Fort Wayne & Western Railroad, is to be used as a highway for a motor truck line which is to be established between Fort Wayne, Ind., and Findlay.

Racine County, Wisconsin, recently voted a bond issue of $2,350,000. According to reports, the funds are to be used for the construction of concrete pavements connecting with highways in Milwaukee, Keonsha, Walworth and Waukesha Counties.

The State Highway Board of Missouri has approved 14 road projects covering 118 mi. of road. The estimated cost of the work is $3,026,231. The projects include 8 mi. of road on the Jefferson Highway, between Kansas City and St. Joseph; about 14 mi. of road in Polk County; about 9½ mi. in Christian County; about 16 mi. in Pemiscot County; 10 mi. in New Madrid County; 11 mi. in Morgan County and 12 mi. in Gentry County.

Earth Road Work in a Nebraska County*

Hall County's Experience in Carrying Out a Contract for a 32-mi. Job has Demonstrated that Earth Roads Can be Built for 30c per Cubic Yard and that Counties Can Succeed in Contracting to do Their Own State and Federal Aid Work.

The actual construction work on the Hall County 32.25-mile project of the state and federal aid road began the middle of August last year. Today the original project is practically completed, with the exception of team work at section intersections, around bridges, a few minor fills, and finishing over bad places by blade graders.

County Organized and Equipped

A year ago Hall County was inexperienced and without organization or equipment to undertake modern methods of road building. Today it has a very capable and experienced organization, one of which any county should be proud. It has ample equipment in excellent condition for any future county work. The organization and equipment will have cost the county by fall almost nothing except the chance plunge in accepting this state and federal aid road project at 30 cents a cubic yard, a figure well below any that was obtained by the state then at an advertised letting.

Grading was started last fall with a crew consisting of one tractor engineer, one grader man, four teams and drivers, and the foreman who is county supervisor and appointed road commissioner. The equipment purchased for use consisted of an Aultman Taylor 30-60 tractor, one Galion road grader, one Stroud elevating grader, two Stroud fresnos, two Stroud slips and seven Stroud dump wagons, at a total cost slightly under $6,200.

The 6 miles north of Grand Island were put to grade between Aug. 13 and Sept. 7. No back slopes were cut upon this work, consequently the grade is lower and the ditch is less deep than it otherwise would have been. More grading may be required here, but it is in good condition for traffic now, and it has been considered best not to do this work this fall. Cutting back slopes with the present heavy sod with insufficient dirt to cover the same would result in a very rough road this fall and winter. Possibly 2 miles of this road may be accepted for graveling this fall without further work.

Between Sept. 7 and Nov. 23, about 3½ miles from Grand Island west were put to grade. Nearly 3 miles of this road were all sand, so a sand-clay surface about 8 in. deep and 16 ft. wide was constructed over it. Observation this year proved that the surfacing should have extended over the entire crown. Also too much clay was placed on the surface, or rather too little sand was brought up from below and mixed with the clay, because the early summer rains produced a slippery, soft road. We hope to remedy this condition by adding 2 in. of gravel this fall. The road surface is very good at present.

Practically all culverts of the small circular concrete type were laid last fall. Head-walls were only completed on 16, which was very fortunate for the bridge contractor, as he is now required to remove all posts from last year's work due to insufficient reinforcement. No bridges were constructed last fall.

Unwise to Construct Small Culverts Ahead of Grade

This opportunity should not be overlooked to state that it appears very unwise to construct small culverts ahead of the grade. This condition this year resulted in much lost time to the contractor, poorer ditch lines, more team work, shifting of many culverts, improperly located, lowering other culverts and the crushing about 80 lin. ft. of 18-in. to 30-in. pipe due to incompleted culvert filling. On the other hand, bridges not yet built prevented the proper cuts and fills, and bad looking spots in the grade resulted. All steel bridges, girders, slabs, I-beams, the larger concrete boxes, and smaller culverts under proposed heavy fills should certainly be constructed to grade ahead of the road work. Most other drainage structures in this flat level country are for purpose of equalization and could well be left until grading is completed.

The 1918 season ended with the county just a little discouraged with the result of its grading contract, because receipts did not begin to equal the expenditures. However, it did not give consideration to the facts that its organization was new and the estimates were only approximate, being about 60% of the preliminary with 20% of this 60% retained as per contract agreement. Also, the heavy expense on sand-clay manipulation and overhaul had not yet been estimated.

1919 Season Starts With New Equipment

The 1919 season started in April with all old equipment besides a new Aultman Taylor 30-60 tractor, new Adams grader and three new Stroud fresnos, representing an additional investment of less than $5,300. The crew consisted of the same foreman with two tractor engineers, two grader men, about four 4-horse teams and drivers, one plow team and driver, one sub-foreman and four laborers.

Work was opened up west of Grand Island where 1 mile of sandy loam was put to grade. From April 21 to 30, the crew moved 2,300 yd. at a cost of 20.9 ct. or approximately $230 profit. The road several miles ahead of this completed section consisted of heavy clay loam saturated with water, which, together with the frequent rains, made road construction impossible here. Consequently the entire crew moved 23 mi. to Shelton at the extreme west end of the road where soil conditions made construction possible.

During the month of May the organization completed nearly 6 mi., which was the prettiest earth road ever noted. Tourists and landowners alike, on several occasions took time to congratulate the road crew. It has been impossible to approach the standard first set due to bad road conditions. Conditions were ideal in almost every particular for blade grader work this month. However, one-half the cost of construction was charged to team work. From May 1 to 30, 21,257 yd. were moved at a cost of 12 1-3 ct. per yd., exclusive of all equipment depreciation, but inclusive of all repairs. The county realized a profit of $3,750.

From June 1 to 30 approximately 4 mi. were completed with total yardage of 11,616 and cost of 21 1-5 ct. or net profit to the county of approximately $1,030. Heavy team work was encountered this month which raised the yardage cost.

The month of July, 1 to 31, witnessed the completion of about 8 mi., exclusive of team work. The yardage totaled 18,935, with a cost of 9.8 ct. per cubic yard, or a net profit to the county of about $3,820. The team work before completion may perhaps double this cost per yard, but still leave the contractor, or county, clear.

Harvest and threshing took the teams from the road, causing considerable disappointment, but another month should see the team work completed. The blade grader will again go over all team work and smooth the grade.

New Project Incorporated Into Old—Care for Surfacing

A new project at present is being incorporated into the old which cares for a surfacing of gravel or clay and gravel as the condition demands, over the entire state and federal aid project. The present county organization has been secured to do the work on a cost plus 15% basis. This is a very good bargain for both parties to the contract.

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*From the monthly report of the Nebraska Department of Public Works.

All sections have dried considerable since construction so that one blade grader will be able now to proceed with the graveling and correct many faults in the road which could not be remedied during construction. This expense will be borne by the country and additional yardage computed when required. All culverts are practically completed in excellent shape. Bridges are expected to be placed before the graveling reaches them.

Drainage is perhaps the most imvortant problem on this project. Fortunately a few of the sections possess a sandy loam top soil with sand subsoil reaching down to fine gravel, so that natural drainage is sufficient. However most of the road has a heavy clay loam gumbo soil which is saturated with water most of the year. Some of the ditches hold water the entire year, so artificial drainage is required.

With the exception of one or two places tile drainage can not be considered because of no available outlet. The country is extremely flat with a scarcity of well defined stream lines nearby or crossing the highway. It is hoped that the experiment with vertical tile drainage to gravel, which underlies the entire district at varying depths, may prove successful. These experiments will be started at once where most needed.

Landowners Give Right of Way

Regarding right of way, very little trouble has been encountered considering the demands that were made. This year it was necessary to move 2 mi. of high tension line, 3 mi. of telephone line, and 8 mi. of fence line. The telephone company and nearly all landowners were very prompt and very agreeable in moving their property. The necessary land at section corners to insure easy curves was given by the landowners without cost.

One section of this project of about 1,800 ft. lies upon the U. P. R. R. right of way. Since the county did not have clear title to this tract it could not be constructed from federal aid, so this section is to be constructed from county funds.

58,800 Total Tonnage to be Hauled Over all Parts of This Project

In order to obtain the approximate tonnage to be hauled over this road this fall a few general questions were put to the farmers along the entire project with the following results: Wheat crop was thin and damaged by rust but yields 6 to 25 bu. per acre, with an average of 12 bu. per acre. Oats range from 30 bu. to 63 per acre with an average of 50 bu. per acre. Alfalfa runs about 1½ ton per acre, first cutting very good, second cutting generally light, due to army worms, third cutting about ready is being damaged slightly by grasshoppers. Corn prospect fine, but rain is needed badly. Long dry weather has already damaged much corn especially on sandy soil. Potatoes are poor, probably not over half a crop. Other vegetables and fruit are good.

From a very conservative estimate the approximate tonnage of produce to be marketed over all or parts of this project this year might be placed at 58,800 tons.

530 People Pass Over Improved Road Daily

A 6-day traffic census of 12 hours per day from Aug. 4 to 9, gave the following information: Average number motor vehicles per day was 184, while the horse-drawn vehicles totaled 22. Motor vehicles were 89.5% of the traffic. Average tonnage per day was 384. Approximately 530 people passed over the road each day.

While the figures above do not indicate very heavy traffic, consideration should be given to the fact that this is a newly constructed earth road which is very easily detoured.

Old Routes Change to New Road

At no time during construction was any portion of the road closed to traffic. However, the proposed gravel surfacing will no doubt require closing a section during the manipulation.

Friends of the Lincoln Highway recently changed the old route from Grand Island to Wood River over the new project. The change was made much too soon, consequently the contractor had a very heavy traffic to deal with on the last 6 mi. of construction.

Leading out of Grand Island all right hand culvert posts are painted with the Lincoln Highway design, while the opposite post on the left is the Pershing Highway design. The Sunflower Route also follows this project, thus throwing three main tourists routes into one out of Grand Island.

Public opinion seems to be very much in favor of state and federal aid roads. A common favorable criticism is that it eliminates all favoritism on the part of the county officials. Also, since more money is available the resulting road is much better. "Continuous supervision, frequent inspection, following definite standards, with a thorough knowledge of road building is the only way to get results," says one landowner. Another remarked: "Give us anything but township roads. I always vote for heavy expenditures on township roads, but whenever I see a mile being constructed I avoid it for a year." People realize that concrete pavement should not be supported upon air and so they foresee the big plan of extensive earth roads for the present which mean permanent foundation for the coming concrete road in the near future.

What Any County Can Accomplish in Road Building

In conclusion it could well be said that this project has proven that: Earth roads through Nebraska's flat country can safely be contracted for 30 ct. per cubic yard. Small culverts should be placed after grading, while other drainage structures should precede road construction. The counties throughout the state should contract their own state and federal aid road at the present high prices, thereby producing for themselves an efficiently trained organization and gaining complete up-to-date road equipment at very slight cost. Full right of way required for any road should be demanded, and property owners requested to comply with state laws regarding same. State and federal roads are fast gaining in public opinion.

———ooo———

Gen. Coleman du Pont of the Delaware Highway Commission, who presented the Delaware Boulevard to that state, has offered to build for the State of Maryland a road about 3½ mi. long connecting the Delaware Boulevard with the Maryland state road system north of Berlin. The Maryland Legislature has already appropriated $75,000 for this connection but because of the cost of labor and materials the fund was exhausted before the entire road was completed. Efforts are being made by Gen. du Pont to secure a 200-ft. right of way to correspond with the right of way of the Delaware Boulevard.

The Planting of Fruit and Nut Trees Along New York State Highways is being planned by the State Highway Commission of that state. State Highway Commissioner Greene favors the planting of the trees, not only for the yield of fruit and nuts, but also because of the protection they would afford the pavements during hot summer weather. It is also stated that if the cooperation of the State Commissioner of Agriculture can be obtained, experiments will be made in raising alfalfa along the roadside, and, according to reports, Commissioner Greene believes that the receipts from the crop will pay a considerable portion of the cost of maintaining the roads.

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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HALF-WIDTH ROAD CONSTRUCTION

If the fact that roads are built for use and for no other purpose were kept more clearly in mind, road builders would probably take better care of traffic during construction. It is realized that road contracts call for the performance of that work, but it can hardly be denied that in too many instances the provisions actually made are inadequate.

The detour is, of course, the most common means of taking care of traffic during construction. The other method, building half the width of the road at a time, could probably be resorted to more often than it is, and for that reason especial interest attaches to the article by Mr. Hempelmann, which appears on other pages of this issue.

Most engineers, we believe, will agree with his contention that the bituminous pavement can readily be built by the half-width method; probably they will even concede that it is a type particularly adapted to that method. But it is not at all unlikely that many engineers will take issue with him upon the matter of building other types in that way.

In the case of cement concrete pavements, for instance, the method has been used to a considerable extent, and is advocated by some engineers. In the discussion of the report of the committee on methods of reconstructing narrow roads, presented at the A. R. B. A. convention last February, two examples were cited. H. E. Breed, the former first deputy of the New York Commission of Highways, told of a pavement on the main road between Buffalo and New York City that was built in two 9-ft. sections, and also of a Long Island road that was originally built 16 ft. wide and later widened by the addition of strips sometimes as narrow as 4 ft. The pavement referred to first, according to Mr. Breed, had not been down long enough to permit drawing conclusions as to the effect of traffic upon the joints. This work was more expensive than by the usual method, he said, but "it seemed to many—and to some members of the department—that the additional expense was amply justified by the results obtained." In regard to the Long Island work he said: "The wear on the longitudinal joint has not been enough up to the present time, after a period of four years, to be appreciable or to require excessive maintenance. I would say that the maintenance ran $50 or $60 per mile yer year."

Whatever difficulties lie in the way of the half-width construction of various pavements might well be made the subject of special study, for it is certain that the traveling public would benefit from the more general adoption of the method.

THE COST OF MOTOR TRUCK OPERATION AS A FACTOR INFLUENCING ROAD DESIGN

Among the multitude of factors influencing the design of highways, the cost of operating motor trucks should have an important place. As a matter of fact, it is probably given much less attention than it deserves.

A road has only one function, exists for only one purpose. That one end is the transportation of passengers or freight. The road in itself is of no use. It has no more value than the roadbed and track of a railroad. Like the railroad track, it can function only in connection with rolling stock which, in the case of the road, consists of horse-drawn vehicles, passenger automobiles and motor trucks. The measure of the service it renders must be expressed in the cost of hauling over it.

This cost is made up of many separate items. The first cost of the road is one of them, but it is far less important than it is generally held to be. The cost of maintaining the surface of the road is another—and one that is considered much too lightly in most cases. The cost of operating vehicles on the road is another, and the one to which it is desired to direct special attention here.

The engineer in charge of design must keep many things in mind, if he is to do his work intelligently, and he must be familiar with many subjects that he did not have to take into account before the era of motor truck hauling. And he must approach his problem from an angle a little different from that from which he has approached it in the past. It is not enough to design a road that will be durable, as cheap as is compatible with the service to be rendered, and agreeable to travel over. He must also plan a road that will keep the cost of operating trucks to a minimum, and this means that he must have more than a superficial knowledge of their operation.

He must know the relative tractive resistances of various pavement surfaces and the effect of grade upon tractive resistance. He must take into consideration all the factors that govern the speed it is possible to make with loaded trucks, for, other things being equal, it is obvious that a road of a certain length that permits a speed of 20 mi. an hour will make possible cheaper hauling than one of the same length that permits a speed of only 10 mi. an hour. It will be necessary, too, to have some idea of the size and type of truck that is most likely to use the road, which implies more than a casual knowledge of the kind and volume of freight likely to be carried over the road. He must know—or know how to ascertain—a great many facts that road builders of a former day did not have to deal with.

And finally, he must balance all these multitudinous considerations, one against the others, giving due weight to all and too great weight to none. In different cases different considerations will be the governing ones. It may be—and often will be—that some one result will have to be achieved at the expense of all others, or that some one consideration will limit the work to something less than the best that could be designed. In such cases the engineer will need not only to build the best he can under the limitations imposed, but also, if possible, will have to so design the road that future changes may be made at the minimum cost—and with the maximum results.

But in all his work he wil have to keep constantly in mind the unalterable fact that the end he seeks is the providing of transportation and not merely the building of a road.

Highway Expenditures in Oregon

Over $23,000,000 from Federal, State and County Funds has been Spent Under the Supervision of the State Highway Department Since Organization in 1914.

Since the organization of the Oregon State Highway Department in 1914, according to recent advices from Portland, there has been expended, or contracts made for the expenditure of more than $23,000,000. Of this total, about $2,000,000 represents county funds spent under the Highway Department's supervision, the balance being state and federal funds.

The $21,071,666.69 of state and federal funds comprises $15,711,335.71 awarded to the counties in the western portion of the state and $5,360,331.26 awarded to counties in the eastern portion.

Examinations for Resident Engineers in Tennessee Highway Department

For the purpose of obtaining a list of eligibles from which appointments as resident highway engineers can be made as required, the Tennessee Highway Commission will hold an examination in the Capitol Building at Nashville on Nov. 3.

Under the law it is necessary that all resident engineers be selected by competitive examination It is not necessary however, to stand examination for the positions of instrumentmen, rodmen and chainmen, or for employment in the various survey parties, and positions of these kinds will be open as vacancies may occur.

Any information concerning the examination or positions may be obtained by addressing W. P. Moore, Chief Engineer, State Highway Department, Nashville, Tennessee.

For Better Earth Roads

Bureau of Public Roads Points Out Considerations That Should Govern in the Planning of Ordinary Roads.

Because nearly all public roads are laid out originally as earth roads, the care and skill employed in designing them have a very direct bearing on future improvements. In view of this and the present unusual activity in all kinds of roal betterment, the Bureau of Pubilic Roads of the United States Department of Agriculture recently pointed out some of the considerations that should govern in locating and designing earth roads. These several points, as set forth by the Bureau, are as follows:

"Sharp curves should be avoided because they are a menace to traffic.

"The width should be ample for vehicles to pass each other without leaving the traveled way.

"If a road ever becomes of any considerable importance, its users probably will demand that all the steeper grades be reduced to the lowest maximum that would conform to the general topography of the region which the road traverses.

"Let the road planners remember that aside from the advantages to traffic of a short route, each mile of additional road involves a considerable extra yearly expense for maintenance, and this alone may warrant the extra expense of shortening the route when the road is constructed, provided that the decrease in distance does not materially increase the steepness of the grades.

"Land lines should be regarded only in so far as this may be done without decreasing the usefulness of the road or increasing its ultimate cost.

"The pleasing features of the route should not be overlooked. Remember that a large part of the travel on most country roads is for pleasure.

"Avoid the necessity for subsequent changes in location. Such changes nearly always work hardship on some of those who have built homes along the original highway."

Federal Aid Work in North Carolina

Large Federal Aid Projects Recently Approved—Progress Since April 1st

The State Highway Commission or North Carolina has recently approved a number of important federal aid road projects. Some of the most important pieces of work included are the following:

Ashe County, Jefferson and Sparta Road, 16 mi., gravel; Alleghany County, Elkin-Jefferson Road, 28 mi., gravel; Alleghany, Surrey and Wilkes Counties, Elkin-Sparta Road, 25 mi., gravel; Bladen County, Fayetteville-Elizabethtown Road, 20 mi., gravel, and road from Elizabethtown to the Robeson County line, 23 mi. gravel; Craven County, Central Highway, 11 mi., hard surface; Duplin County, Kenansville-Clinton Road, 13 mi., gravel; Davidson County, Lexington-Winston-Salem Road, 2 mi., hard surface; Harnett County, Raleigh-Fayetteville Road, 28 mi., gravel; Henderson County, Hendersonville to the county line, 11 mi., gravel; Hyde County, Swan Quarter to Leechville Bridge, 22 mi., gravel; Moore County, road between Lee and Montgomery County lines, 28 mi., gravel; McDowell County, Burke line to Project No. 3, 29 mi., gravel; Stokes County, Danbury-Westfield, Road, 20 mi., gravel.

In addition to these projects, the construction of a bridge over the Pee Dee River in Stanley County, was approved. The estimated cost is $80,000.

There were 42 Federal aid projcts in the state on April 1 of this year, when the present commission assumed office. This number has been more than doubled since then and there are now about 90 projects, comprising some 500 mi. of road. Of these projects, 29 are actually under construction.

The commission has received 243 motor trucks from the Federal Government and is using them in construction and maintenance work. The value of these and other equipment owned by the Commission is over $1,000,000.

———OOO———

Grade Crossing Accidents on the Southern Pacific Railroad during the first four months of the year numbered 151, according to statistics compiled by the company. In 20 cases machines stalled on the crossings and were struck by trains. Sixty-eight automobilists attempted to cross in front of moving trains; 36 ran into the sides of the trains; 16 ran into and broke down crossing gates which had been lowered; 1 skidded into the side of a car; 1 ran down and injured a crossing flagman; 4 ran into signal posts, and 5 accidents were unclassified. The accidents resulted in 9 deaths and 45 injuries.

HIGHWAY TRANSPORTATION

Trucks Carry Farm Produce

Farmers and Motor Express Line Operators Find Motor Trucks Both More Satisfactory and Cheaper Than Horse-Drawn Equipment

Operated either by the farmers and dairymen themselves, or by men making a business of highway transportation, motor trucks are every day proving their suitability for bringing farm produce to city markets. Several instances in which motor truck hauling has solved the marketing problem were recently cited by the White Company, the manufacturer of White trucks.

One of these trucks is used by H. L. Christensen, of Bay Village, Ohio, to haul his produce to the markets in Cleveland. His machine, loaded for the trip, is shown in one of the accompanying illustrations. He hauls capacity loads over good, bad and indifferent roads, and finds the method economical.

A similar case is that of Thomas T. Husson & Sons, of Pomona, N. Y., who use an eight-year-old White machine to haul peaches, apples, cauliflowers and cabbages to New York City, 35 mi. away. Before purchasing the truck, produce was shipped to the city by express and a commission had to be paid for its sale. In the winter the truck is used to bring lime, fertilizer and various farm supplies from the city.

Truck owned and operated by J. C. Helms, of Swedesbore. N. J.

Truck owned and operated by H. L. Christensen, of Bay Village, Ohio

WHITE TRUCKS USED TO HAUL FARM PRODUCTS TO CITY MARKETS

Another producer, the Fair Oaks Farm at Lincoln, R. I., operates a ¾-ton truck daily over a 25-mi. route. The monthly gasoline bill, according to the manager, is from $33 to $35. Another regular delivery service is maintained by the Easthampton Cooperative Milk Association, of Easthampton, Mass. A 1½-ton machine, purchased in 1912, has been run about 40 mi. a day, six days a week, since that time, taking the place of four horses.

A truck route is operated by J. Clark Helms, of Swedesboro, N .J., who makes a specialty of gathering poultry, lambs and miscellaneous farm produce from the agricultural country within a 50-mi. radius of his home and delivering it to the Philadelphia market. He uses ¾-ton White trucks, one of which has been in continuous operation since 1911 and has covered over 130,000 mi. The trucks are run every day, sometimes under very trying road and weather conditions. Mr. Helms claims never to have fallen down on a rush delivery and ascribes the growth of his business to the dependability of the trucks. Two of his machines are shown in one of the accompanying illustrations.

A somewhat similar business is carried on by the Tuscola Produce Co., of Tuscola, Ill. This company uses a ¾-ton truck to collect poultry and eggs and haul them to its plant. One of the officials of the company is authority for the statement that more can be done with the machine than could be done with four horses and at a much lower cost.

Motor Transport Training Schools Established by the Army

The United States Army has undertaken vocational training for the Motor Transport Corps, according to a recent announcement by the United States Civil Service Commission.

This step has become necessary because the number of men skilled in automotive vehicle operation and repair is not sufficient even to meet the demands of civil life, and the war has demonstrated that the efficiency of the Army depends upon the motor transport branch.

The Army is organizing schools to train men in the various branches of automobile construction and operation and the Civil Service Commission is receiving applications to fill 150 positions of assistant instructor in these schools. The entrance salaries range from $1,800 to $2,400 per year. Detailed information may be obtained from the Civil Service Commission at Washington, D. C., or from the civil service boards at post offices and custom houses in other cities.

MEETINGS

Calendar of Meetings

Nov. 11-14—American Society for Municipal Improvements—Annual convention, New Orleans, La. Secretary Charles Carroll Brown, Valpariso, Ind.

Jan. 15-16, 1920.—Southern Appalachian Good Roads Association—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Feb. 9-13, 1920—American Road Builder's Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Apr. 12-17, 1920—United States Good Roads Association.—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Apr. 16-17, 1920—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

At a meeting of the Illinois State Association of Highway Commissioners and Town Clerks held recently at Peoria, Ill., W. Rufus Kendall of Watseka was reelected president. W. H. Freeman of Chicago Heights was elected vice president and William Saunders of Peoria secretary and treasurer. The 1920 convention will be held in Peoria.

PERSONAL MENTION

Lt. Col. A. D. Stivers, until lately a member of the engineering firm of Duck & Stivers, of Greenville, Texas, has entered the employ of the Texas Company. Col. Stivers will represnt the asphalt sales department in North Texas and will have his headquarters at Fort Worth.

Charles Carroll Brown, formerly editor of "Municipal Engineering", has been appointed professor of civil engineering at Valparaiso University, Valparaiso, Ind. For the past year he has been assistant maintenance engineer with the Division of Highways of the Illinois Department of Public Works and Buildings, but has obtained a year's leave of absence.

Walter E. Rosengarten has resigned as highway engineer with the United States Bureau of Public Roads to become traffic engineer with the Asphalt Association, with headquarters at the Association's main office in New York City. Mr. Rosengarten is a graduate from the Engineering Department of the University of Pennsylvania and has been with the Bureau of Public Roads for about eight years. Part of his time with the Bureau was spent in construction work and part in the research and testing division in laboratory and field work.

B. W. Twyman has been appointed manager of the Milwaukee factory to be built by the Nash Motors Co. for the manufacture of 4-cylinder cars. The Milwaukee plant will eventually be as large as the main factory of the company at Kenosha and will be used exclusively for the production of 4-cylinder cars. The 6-cylinder cars and trucks, including the Nash Quad, will be built at the Kenosha plant.

Capt. Robert B. Murdock has been appointed executive engineer of the Asphalt Association of New York, N. Y. Capt. Murdock has had extensive experience in highway work, including some time as resident engineer in charge of the construction of one of the most difficult sections of the Columbia River Highway in Oregon. He was later made assistant state highway engineer of Oregon and held that position until he entered the military service.

PUBLICATIONS

VERMONT SOCIETY OF ENGINEERS. Proceedings. Paper 6x9 in.; 87 pages and covers. Published by Vermont Society of Engineers, Montpelier, Vt.

This number of the proceedings is devoted entirely to a report of the meeting of the society held on March 12, 1919 The contents include the several papers and the reports of the discussions following their presentation

ONTARIO GOOD ROADS ASSOCIATION. Proceedings of the 17th annual meeting held at Toronto, Ont, March 5, 6 and 7, 1919. Paper 6½x9½ in.; 62 pages and covers

This copy of the proceedings includes a complete report of the meeting, including the text of the papers presented and verbatim reports of the discussions, together with a list of officers and a financial statement

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUG. 24, 1912, OF "GOOD ROADS," published weekly at New York, N. Y., for Oct. 1, 1919.

State of New York, County of New York, ss:

Before me, a Commissioner of Deeds in and for the State and county aforesaid, personally appeared E. L. Powers, who having been duly sworn according to law, deposes and says that he is the Editor and Business Manager of "Good Roads," and that the following is, to the best of his knowledge and belief, a true statement of the ownership management (and if a daily paper, the circulation,) etc., of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse side of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher—The E. L. Powers Co. (Inc.), 150 Nasau Street, New York, N. Y.

Editor—E. L. Powers, 150 Nassau Street, New York, N. Y.
Managing Editor—T. A. Hulbert, 150 Nassau Street, New York, N. Y.
Business Manager—E. L. Powers, 150 Nassau Street, New York, N. Y.
2. That the owners are:
The E. L. Powers Co., (Inc.), 150 Nassau Street, New York, N. Y.
E. L. Poweds, President, 150 Nassau Street, New York, N. Y.
C. J. O'Brien, Treasurer, 150 Nassau Street, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given: also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person. association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above it: (This information is required from daily publications only.)

E. L. POWERS, Editor & Bus. Mgr.
Sworn to and subscribed before me this 14th day of October, 1919.
(Seal)
O. D. CONKLIN,
Commissioner of Deeds, N. Y. C.
(My commission expires May 21, 1920.

GOOD ROADS

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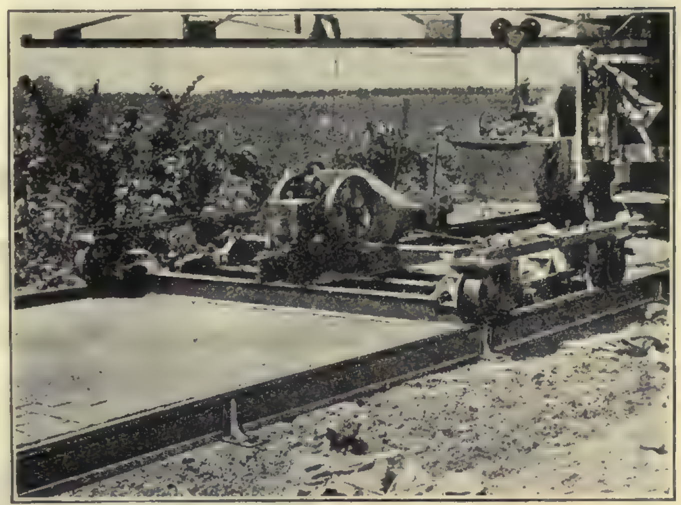

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GOOD ROADS.

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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Number
17

Hard-Surfaced Roads--I*

A Discussion of Different Types of Hard-Surfaced Roads, with Especial Reference to Conditions in North Carolina---Methods of Construction and Causes of Failure of Different Pavements

By E. J. WULFF †

The subject assigned to me relates to hard-surfaced roads. With the energies of the South largely concentrated to improve the transportation lines from the farm to the market, or to the primary transportation lines, the railroads, and to the industrial centers of the South, the question of road construction generally, and hard-surfaced pavements in particular, becomes of supreme economic importance.

This is not the place to enlarge upon the subject of transportation lines, whether primary or secondary. The importance is fully recognized, and a construction program of unequaled magnitude throughout the South by the states, counties and municipalities is the result of the recognized necessity to have improved transportation lines.

Because the South has lagged behind other states in road building, it follows almost as a necessity that the subject of pavements is not fully understood by many of the officials and engineers to whom will be entrusted the construction of this enormous program, and a convention like this where everybody comes to learn must be of real benefit to those who come with an open mind. The South will have the benefit of the experience of other states where errors have been made and their nature has been recognized. In other words, the South does not need to make expensive experiments; it can profit by the experiments that other states have made. Anyone who is familiar with the real situation knows that a large part of the money invested in what were supposed to be permanent roads has been lost. This is, of course, not entirely due to mistakes, but very largely to the changed method of transportation from horse-drawn vehicles to motor vehicles, and more particularly to the ever increasing loads placed on motor trucks. The latter have come to stay and will become

GRANITE BLOCK PAVEMENT ON BLOOMFIELD AVENUE A HEAVILY TRAVELED ROAD OUT OF NEWARK, N. J.

DURAX PAVEMENT AT PARK AVENUE AND CLAREMONT PARKWAY, BRONX BOROUGH, NEW YORK CITY more and more the means of transportation not only for the short haul, but for an intermediate long haul as well, and this will have a tendency to obviate the construction of secondary railroad lines.

---

*Paper presented at the 20th annual convention of the North Carolina Good Roads Association, Harbor Island, Wrightsville Beach, N. C., Aug. 13-15, 1919.

†Senior Highway Engineer, Bureau of Public Roads, U. S. Department of Agriculture.

These conditions will have to be considered in the design of many roads that will be constructed by the South, and the correct solution of this problem means either success or costly failure. Horses and mules will continue as heretofore to travel our roads, but with the construction of hard-surfaced roads they are not a very important factor for consideration. By "hard-surfaced pavements" we usually understand a class of pavements that has heretofore generally been built in cities and towns where heavy local traffic and other considerations demand road surfaces of that sort. Similar pavements must now be laid by the county as well, and the selection of an appropriate type is one of the important phases of the problem. And the other even more important problem is proper construction after a choice has been made.

It does not follow that all roads should be hard-surfaced roads—far from it. Hard-surfaced roads will, in all probability, represent a small percentage of all road improvements and will be principally along the main traffic lines.

Generally hard-surfaced pavements are classified as granite block pavements, brick pavements, asphalt pavements and the concrete pavements. Each type has numerous subdivisions and variations, and the various types are applicable to various conditions of traffic. Sometimes a question of temporary or permanent economy decides the choice of pavement, and many of the types included in the general category have individual qualities that make them particularly applicable for certain traffic conditions.

SHEET ASPHALT PAVEMENT ON THE ANCON PEDRO MIGUEL HIGHWAY, PANAMA CANAL ZONE.

The first type of pavement, namely granite block pavement, is not likely to be laid extensively on county roads except possibly near cities or towns.

The method of construction of granite pavements has undergone marked modifications in recent years, and there is a general tendency to decrease the size of the blocks from the prevailing size of former years. As the pavement is generally intended to provide for the heaviest traffic, the foundation is usually concrete, and is represented by two types. The type for heaviest traffic consists of a block 8 to 10 in. long, 5 in. wide and 6 in. deep, laid on a sand bed on a concrete foundation. The practice of joint treatment is one of the most important points to be considered. One method is to fill them with cement grout, and if the pavement is laid with painstaking care to present a smooth surface the method is satisfactory in most cases.

Another type of joint filler offering greater security under heavy traffic conditions is the bituminous mastic joint filler. This joint filler consists of nearly equal parts of hot sand and hot bitumen. This type of filler requires a concrete base and carefully placed sand bed. A further advantage is obtained by using a sand-cement bed, as this furnishes a more rigid base for the blocks that are held together by a somewhat plastic joint. The latter is, however, a distinct advantage as it will transmit the shock received under heavy impact without breaking the joints.

A notable example of the failure of a high class granite pavement has come under my observation. At the time, it caused considerable discussion in the technical press. The granite block pavement with grouted joints was laid on 42nd St. in New York City, between Times Square and the Hudson River. The pavement was laid to provide a permanent road for the disposal of the rock spoil from the subway excavation. The road has a grade of about 3% for part of the distance. The spoil of the subway was carried in heavy auto trucks, weighing about 15 tons, to the river. The destruction of the pavement commenced almost immediately and was observed by me from time to time. In the beginning some attempts were made at repair, but when it was found impossible to maintain the pavement it was allowed to go to pieces. In the later stages of dis-repair the road surface resembled the spoil bank of a quarry more than a road surface. The reason for the failure is not difficult to analyze. The mortar or grout joint, taking the impact of the rapidly moving load from the adjoining paving block, was crushed to powder; and later on, the block itself, without any lateral support, was also crushed. A mastic grout filler instead of a mortar joint might possibly have saved the pavement.

It is believed from this spectacular failure of what was then considered the highest type of pavement laid, that no pavement was ever subjected to similar destructive traffic for such an extended period, and this seemed to be manifest at the time. Owing to the grade of road, the truck drivers made what speed they could, regardless of traffic regulations. As considerable of the hauling was done during the night, this was comparatively easy.

The Bureau of Public Roads has been making a series of experiments with rapidly moving loads on uneven surfaces, which clearly indicates the destructive effect on pavements of various sorts. Up to the present time the loads have been limited to a maximum of 5 tons and to a speed of 15 mi. per hour. The intention is to carry the experiments further by increasing both load and speed. The result of these tests, so far made, are substantially as follows:

A load of 5 tons, exerting a pressure of 7,750 lb. on one rear wheel, produces an impact, when dropping 3 in., of 42,500 lb., or nearly six times the actual weight. If the impact is cushioned by a rubber tire of reasonable width, this blow may not be destructive, but if exerted by a hard steel tire, there are few materials strong enough to withstand such an impact without crushing. The pavement that was destroyed, being composed of granite blocks and cement grouted joints, must have been subjected to impact stresses probably exceeding 20,000 lb. per square inch. This is the crushing strength of granite block; while the crushing strength of the cement joint was probably not over 2,500 lb. per square inch. Failure under such conditions was inevitable.

The second type of granite pavement that has come into prominence during recent years is the so-called Durax pavement. This pavement consists of uniformly cut granite cubes, 5 in. and 4 in. in their general dimensions. This pavement has been advocated for trunk lines where heavy auto truck traffic may be expected. This type of pavement has not yet been adopted for the heaviest traffic roads, as the results so

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GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
Editor

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Managing Editor

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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIII OCTOBER. 22, 1919 No. 17

TO OUR READERS

When the printers' strike in New York City commenced on Oct. 1, "Good Roads," like scores of other periodicals, was held up for several weeks pending efforts to adjust the differences that led to the strike. After more than three weeks of efforts on the part of the publishers and the employing printers of the city, it was decided by the publishers to make temporary arrangements to print in other cities. In accordance with this decision, "Good Roads" of Oct 8 was printed elsewhere, and at this writing the arrangement is still in force.

This will explain the delay in putting this and other issues into the hands of our readers. Back issues will be printed as rapidly as possible and we hope to be issuing on the regular schedule in the near future.

Such apologies as may be necessary for the size and appearance of the issues printed under the present conditions are tendered. In order to reduce the amount of mechanical work incident to printing, the number of pages in each issue has been cut down to the minimum. The appearance necessarily differs from that of the publication that has been gotten out heretofore because the printers who are doing the work do not have exactly the same kind of type that has been used in the past. It will also be understood that there are many obstacles to be overcome in printing a periodical several hundred miles from the editorial and business offices and that, consequently, an occasional error may occur.

Just as soon as possible, publication will be resumed under normal conditions, and in the meantime we must ask the indulgence of our readers.

BITUMINOUS PAVEMENTS ON RURAL ROADS

In the article on hard-surfaced roads, commencing in this issue, the author has given a complete and concise description of the various types included in that classification and has done so in a generally fair and impartial manner. While road builders will find minor points on which they may differ with him, it is doubtful if the disagreement can be serious except perhaps on one point. Though Mr. Wulff apparently has a high regard for the asphaltic concrete pavement, he makes the statement that "asphalt roads have somewhat fallen into disrepute by the poor results frequently obtained."

We cannot agree with him that asphalt roads have "fallen into disrepute," nor do we believe that highway engineers who look at the subject from an unbiased viewpoint will subscribe to that statement. It is readily conceded that poor results have frequently attended efforts to build bituminous pavemens of one kind and another, but these have been more than offset by the excellent results in other cases and, as indicated by Mr. Wulff, the failures have been due more often to unskillful or careless workmanship, or faulty specifications, than they have to the material in question.

As a matter of fact, we believe that the indications are that bituminous roads are growing in favor with engineers and with road users. Under present conditions, every material has its place in road and street work. It will continue to have its place unless there develop conditions much different from any towards which it is reasonable to look forward. The place of bitumen seems sufficiently assured.

LAYING OUT ROAD SYSTEMS

Most present-day road work consists of the improvement of existing roads by the laying of new wearing surfaces. Occasionally more or less extensive relocation is also involved, with, of course, the doing of a certain amount of work that is really new construction. But the highway engineer's opportunities to build entirely new roads are comparatively infrequent and his opportunities to lay out entire systems of roads are still less common. When there is a chance to do such work it permits the engineer to exercise his greatest skill, to do work that is engineering of a high order.

Laying out an entire system calls for the application of a very wide range of knowledge and the utilization of experience of many different kinds. It means a most painstaking and intelligently conducted investigation of the traffic needs of the area to be served. It means a study of the economic conditions of the community, with special reference to the amount of money available. It means the making of thorough preliminary surveys of the ground to be covered. And when this preliminary work has been completed, the designing of the roads must be done.

Unfortunately, this latter is the only work that is generally recognized as engineering. The public thinks of an engineer —when it thinks of him at all—as a man who runs lines and drives stakes, bends over a drawing board or bosses a gang of laborers. Sometimes the engineer himself takes a similar view of his work.

As a matter of fact, the engineer's most important work is something quite different, involving what is commonly regarded as "business." The real engineer is a business man and an organizer, a planner and an executive. In much of his work he can be little more than a designer and constructor, but when he is assigned to lay out and build a complete road system, he has an oportunity to do everything for which he has been trained.

To Test Oregon Bond Law

As a result of the refusal of the Oregon State Board of Control to grant the request of the State Highway Commission for the issuance of $1,000,000 worth of highway bonds, the latter body will institute mandamus proceedings to compel the granting of the requisite permission, according to a recent report.

The proceedings will test the Bean-Barrett Law enacted by the 1917 Legislature to provide for issuing highway bonds amounting to $1,800,000 to match the state's apportionment of federal aid money. Bonds to the amount of $1,200,000 have already been issued and the Board of Control holds that it has no authority to grant the request for $1,000,000 more, as the entire sum would exceed that authorized by the law.

The Highway Commission contends that the intent of the law is to authorize the issuance of bonds sufficient to meet the federal aid grants and that since the amount available from the federal treasury has been increased, the state may incur bonded indebtedness beyond the $1,800,000 specifically authorized, up to the constitutional limit of 2 per cent. of the state's assessed valuation, or to $20,000,000. The total bonded indebtedness thus far authorized is $17,800,000.

Hard-Surfaced Roads

(Continnud from page 188)

far have not been entirely conclusive. If laid as a monolithic pavement, it is undoubtedly subject to the same destructive agencies, due to the inherent weakness of the mortar joint, unless laid on the rigid foundation of a sand-cement bed and with a bituminous sand filler joint.

The sand-cement bed appears to be one of the essential features of the small block pavement, as a sand cushion has too small a bearing surface and suffers sufficient dislocation and compression under sudden impact to cause immediate separation between the mortar joint and the adjoining block. A sand filler is not adapted for small block pavement, and all the other methods commonly employed, in the form of pebbles and poured asphaltic filler, have been superseded by the grouted joint and the sand and bituminous mastic joint.

Asphalt pavement is the prevailing city pavement and the type most frequently to be found is sheet asphalt. This pavement may be called the parent type of all other asphalt pavements of which the most prominent are asphalt block pavement and the various asphaltic concretes. Among the latter type belong the Bitulithic and Warrenite pavements, the Topeka type of pavement and many other varieties that have in many cases obtained more than local reputation.

Essentially well constructed sheet asphalt pavement requires a rigid foundation, whether it is of the concrete or the macadam type. Where a pavement is newly constructed, a concrete foundation is usually laid, but where old, well consolidated macadam roads exist, that foundation is entirely satisfactory. The depth of foundation varies with climate and soil conditions. I believe that a depth of from 4 to 6 in. in this state would meet all the conditions that climate or drainage would impose. The sheet asphalt itself consists of two courses, the binder course, which takes up half the depth of the pavement, and the sheet asphalt, taking up the other half of the depth, having a total depth usually of 3 in. The binder course is described as a close or open binder. The former is preferably laid when the foundation is more or less porous, such as old macadam. An open binder is laid usually on a concrete foundation. The binder course is composed of crushed stone, or a mixture of crushed stone, sand and asphalt, the latter in sufficient amount to coat all stone and sand particles. In this condition it can be compacted by rolling, and forms the lower half of the pavement. It performs an important function in that it gives stability to the wearing surface on account of the interlocking stone particles in the binder coat. The wearing coat is composed of particles of sand, all of which should pass a 10-mesh to the finest sand particles, mineral dust of exceeding fineness passing a 200-mesh, and asphalt cement.

Up to the foundation of the binder course, the subject is not very difficult. Beyond that point, namely, in the formation of sheet asphalt mixture, comes the opportunity of the engineer. Given the necessary materials, he can make a combination of them that may turn out a pavement good for five years, or good for twenty years, according to whether he is just an ordinary engineer or an expert. The reason why some sheet asphalts are poor and others good, and still others excellent, has been obscure for many years, and in many cases, long year tests were necessary to demonstrate the reasons. Without going into a lengthy explanation of theories, that sheet asphalt is the best in which the voids between the larger sand particles, and again the still smaller voids thus created, are occupied by still smaller particles, so as to form an interlocking mass of material containing a minimum of voids. When it is considered that ordinary concrete sand contains 35% of voids, it can be seen that a much finer sand must be added to occupy those voids. While cities that lay sheet asphalt pavements extensively have recognized this necessity and improved their natural sand material by additions of necessary other gradings, small cities that lay an occasional pavement very rarely have the expert engineer, but depend largely upon the contractor for what many consider merely routine work at the mixing plant. Together with the mineral aggregate, the asphalt cement or bitumen is of greatest importance, but whether it is an oil asphalt or natural asphalt is of less importance than the grading of the sand. The best asphalt used may be of a temporary advantage in a poorly graded mixture, but an inferior asphalt will produce a far better pavement if used with a good sand grading.

It can not be emphasized too strongly that the grading is of supreme importance.

The penetration of the asphalt is another point that is not understood by many road engineers. In a general way, it has been customary to give the penetration requirement too great a range, with the result, in many cases, that asphalts of varying, instead of uniform consistency, have been used on the same project.

I may be pardoned if I go into the question more extensively than the subject seems to warrant, as sheet asphalt pavement is not frequently laid on country roads. The discussion applies as well to other types of asphalt pavement, and my experience has been that comparatively few highway engineers have so far been able to apply correct principles, because the principles are not understood by them. This is brought home to me quite frequently, as many of the state specifications come to me for review. In a discussion recently with a state road engineer of another state, he stated to me that the success of an asphaltic concrete road was a matter of good luck rather than good management and that the formula did not mean anything to him. A similar opinion was expressed in letters by at least two state highway departments in answer to our comments on their asphalt pavement specifications. There was an effort in one case by one state to change the formula to conform to our suggestion, but the attempt was merely amusing, and the result showed an utter lack of understanding of the underlying principles. The situation is all the more regrettable, as asphalt roads have somewhat fallen into disrepute by the poor results frequently obtained, when they are really deserving of far wider employment than is the case, and in spite of the fact that many cities go on serenely building good asphalt roads, knowing that they will give the maximum of good service.

(To be concluded)

Massachusetts Highway Association

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Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston

News and Gossip

A committee has been appointed by Mayor Walsworth of Revere to consider the matter of renaming certain city streets and parks after Revere soldiers who died in the war.

The Woburn City Council will consider at its next meeting an order to compel the Eastern Massachusetts Railroad (the old Bay State) to move approximately 3 mi. of trackage on Salem, Cedar, Washington and Bow Streets and Montvale Road. The tracks on the first three named are part of the former Reading Line which was discontinued more than a year ago. The State Highway Commission is seeking to get the city to build a new road, but the officials refuse to make the improvement until the tracks are torn up.

Many members of the Massachusetts Highway Association are not aware of the law requiring mirrors on motor trucks. That owners and drivers are not complying properly with the law that recently went into effect requiring mirrors on such vehicles where the drivers cannot see the road in the rear, has come to the attention of the Highway Commission, which has issued a warning on this matter. In this connection the Commission says:

"The Massachusetts Highway Commission finds a great many owners of motor trucks who are not using any judgment in attaching mirrors to their trucks in carrying out the intent of the mirror law recently passed by the Legislature. The inspectors of the Commission find a great many very heavily loaded trucks on very wide bodies equipped with a very short arm on the mirrors, the result being that the operator cannot see the road in the mirror of his truck any better than if he had no mirror at all.

"What the truck owners must do is put a sufficiently long arm on the mirror so that the mirror will project beyond the width of the truck and show the road to the rear. It may be necessary to have a 2-ft. or longer arm on the mirror to comply with this provision on certain trucks and an 18-in. arm on many trucks."

The City Council of Boston has passed a resolution favoring $5 per day for city laborers. The painters of buildings and elevator men are also included in the proposed increase.

The Government's good roads program calls for the distribution of 20,000 motor trucks of various sizes and makes. The distribution of trucks is to be based on the road building appropriation in each state. For five of the New England states, the allotments are as follows: Massachusetts, 303; Maine, 196; Connecticut, 124; New Hampshire, 83; Vermont, 95. In a number of states special legislation will be necessary to cover the maintenance of these trucks.

Leicester Hill, the bane of motorists throughout the East, especially those going from Boston to Springfield at frequent intervals, will soon be eliminated from the main route. Plans for avoiding the hill are in the Worcester office of the Highway Commission, and town officials and Worcester authorities say that before the coming summer is well advanced action will be taken in doing away with one of the most dangerous pieces of road in the country. Two plans are under discussion and one of them will be utilized. The one most favorably looked upon is to build a road around the hill through the land of Congressman Samuel A. Winslow. There is now a road around the hill on this side but it is suitable only for horse-drawn vehicles, and motor cars are barred. The plan proposed includes the widening and resurfacing of this road, making a permanent stretch of motor highway. The other plan, not favored by many, is to build a road around the south side of the hill which, while easier to construct, is not believed to be as economical as to resurface and widen the north road.

Representatives of patriotic societies and citizens' organizations of Boston have vigorously protested the renaming of certain city streets and squares in honor of war heroes.

While the protestants in most cases did not deny that the service men, many of whom paid the supreme sacrifice in the war, should be honored, they said they thought more appropriate memorials could be chosen, thus leaving intact the historical and sentimental value of the streets and squares involved. The committee will report its recommendations on the issues at the next meeting of the council.

Spirited opposition met proposals to name the junction of Adams St. and Dorchester Ave. Hartin Square; to change City Square, Charlestown, to Col. Frederick B. Bogan Square; Independence Square, South Boston, to Col. Edward L. Logan Square, and to make other changes.

The Executive Committee of the Massachusetts Real Estate Exchange has adopted resolutions opposing changing the names of streets and squares in the City of Boston which have long been known by their present names, for the reason that such changes will lead to great confusion in the purchase and sale of real estate and in the examination and transfer of titles, and will cause great public inconvenience.

More than $2,500,000 has been paid to the state this year by motorists in fees for registration certificates and driving licenses. Up to the first of the month the receipts were $2,553,761.54, which breaks all previous records. In the whole of last year the total was $2,184,408.37. Although September is one of the quietest months in the year in the registration of cars, the receipts last month amounted to $93,737, which is more than $40,000 in excess of the receipts of the corresponding month of last year.

There were given out up to Oct. 1, 170,000 sets of number plates for passenger cars and 40,000 sets of plates for commercial vehicles, compared with 142,600 passenger car and 33,059 commercial vehicle plates issued during all of 1918. During July, August and September of this year the Highway Commission took in $401,938.41 in fees, against $275,530 36 in the same months of 1918, a gain of $126,309.05, or over 45 per cent.

An interesting situation has arisen in Malden on account of the prolonged illness of Mayor Blodgett, who has been at his summer home in Canaan, N. H., confined to his bed for more than 60 days. According to Chapter 278 of the Acts of 1900 i,t is provided that when the mayor of any city is absent for 60 days, the City Council may declare the office vacant and proceed to fill the vacancy. It is not known what action will be taken in this particular case.

A bridge connecting Springfield and West Springfield, to cost $3,608,000, is provided for in a report of a bridge commission headed by former Governor John L. Bates, filed with the Supreme Judicial Court recently. The bridge is designed to replace a wood structure erected in 1816. Construction will begin next spring. The other members of the bridge commission are Joseph H. O'Neil, a banker, and Joseph R. Worcester, an engineer, both of Boston.

The next meeting of the Massachusetts Highway Association will be at the American House, on Nov. 11, at 12:30. Before the luncheon is served, the regular quarterly business meeting will be held.

New Hampshire Goods Roads Association

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A petition has been circulated by the Postmaster of Laconia, to have Canal St. laid out and paved from Main St. to Beacon St. The money was appropriated for this work some time ago but the work has been held up on account of the difficulty in reaching an agreement with the Laconia Car Co. in regard to shutting off its water power while a portion of the work is being done.

The Maine Legislature has now under consideration a proposal to issue state bonds for not over $3,000,000, of which $2,000,000 is for state highways and $1,000,000 for interstate and international bridges. This bill was presented by the Committee on Ways and Bridges and is now being considered by the joint committee which is preparing for the extra session next month.

If New Hampshire is to obtain assistance from the Federal Government for road work to the extent of $650,000, it will be necessary for the Legislature to appropriate a like sum.

The cost of practically everything that enters into construction and maintenance has steadily increased until it is found that the cost of sections of road constructed in this state last year exceeded $30,000 per mile.

Aside from the money required for new work, the question of providing for the maintenance of existing roads, the law calls for a tax in each town of one-quarter of 1 per cent. of the valuation in such town, this fund to be available for all road purposes; it must set aside $1 on each $1,000 of valuation for the permanent improvement fund, the latter to be expended under the supervision of such town.

If a town desires state aid it must, in addition to $1 per $1,000 valuation, set aside 50 per cent. of the amount raised for road purposes, aside from the $1 on $1,000 as such town's contribution to the "joint fund."

In the distribution of the "joint fund" to the various towns, the apportionment ranges from 20 ct. to $3 on the dollar of the town's contribution to the fund. The fund amounts to $125,000.

During the fiscal year of 1919, which ended Sept. 1, last, there was available for state aid construction approximately $200,000. For maintenance this year there has been available about $4,000,000 from the licensing of motor vehicles and $250,000 contributed by the towns to the joint fund. It should be borne in mind that this is for maintenance, not for the construction of new roads.

The federal projects relate only to new roads, and the maintenance of the state aid roads must be taken care of outside of the state's part in meeting Uncle Sam on a 50-50 basis in order to secure a share of Government money.

There will be available for trunk line construction next year approximately $1,300,000, providing the state is willing to match dollar for dollar the $650,000 which the Federal Government is ready to appropriate for New Hampshire roads.

The Federal Government does not say to New Hampshire, "Here is $650,000 and you can have as much of it as you are willing to match dollar for dollar." The federal highway department figures out that it is willing to spend $650,000 on New Hampshire roads, and no more than that, this year. It also will spend that amount or nothing.

Thus the Federal Government holds the whip hand if this state is to follow the policy of availing of Uncle Sam's assistance in the construction of trunk lines. This policy makes it possible to avoid bond issues, and at the same time, makes absolutely necessary a mounting maintenance fund. Here is where the question of taxation comes in good and strong, and it is one of the phases of this question which will furnish material for consideration by the next session of the Legislature.

Some interesting developments of the result of city employees being unionized: In Manchester the city employees' union has succeeded in bringing about the removal of four inspectors in the garbage collecting department who did not belong to the organization.

The union officials hold that foremen and inspectors should in every case be union men promoted from the ranks. There has been little opposition to this plan on the part of Director Lord of the Public Works Department, as he has favored this method of obtaining men to have charge of laboring gangs.

A petition of the employees of the Highway Department of the Town of Franklin asks for an increase in wages amounting to about 15 per cent. Three months ago an increase of 25 ct. per day was allowed, bringing the pay of laborers to $3.25 and teamsters to $3.40 per day. The matter was referred to the Highway Committee.

Federal aid work in Concord has been advertised but no bids have been received.

The contract for the bridge in Canaan has been awarded to the United Construction Co., of Albany, N. Y., and work is expected to be started soon.

One well known Concord industry has been abandoned after more than a century of useful work. There will never be any more Concord coaches, for the factory has been turned over to the manufacture of automobiles. These coaches are familiar to everyone who has heard or read of the pioneer days in the West and no western movie is complete without one. Hung on straps for springs and with the large diameter dished wheels, these vehicles followed the pony express as a means of transporting mails and passengers in the early days and like the "one-hoss shay" they seemed to wear indefinitely. The most noted coach was the one used by Buffalo Bill in his wild west show.

The contract for the bridge in the town of Merrimac has been awarded to Winslow & Cummings, contractors, of Nashua, N. H.,

Federal aid work in the town, which is being done by the same firm, is practically completed.

Bids were opened Oct. 15 for the federal aid work in the town of Amherst.

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Crusher Run

Benjamin P. Wheat, Chairman of the Highway Committee of Sarotoga County, explained at a recent meeting held before the members of the Saratoga Springs Chamber of Commerce, Commissioner Greene's plan to shorten the route between Albany and Saratoga Springs by 5 mi. This will be done by constructing a new piece of road between Crescent and Round Lake. Mr. Wheat is counsel for the New York State Road Builders' Association. If the above plan is carried out it will be as valuable to the people of Albany as it will be to those of Saratoga Springs.

James T. Taaffe, who has been connected with the office of the state highway commissioner since 1913, acting as private secretary to Commissioners Carlisle, Duffey and Greene, has resigned to accept an appointment in the State Income Tax Bureau.

John J. Hyland, of New York City, who served with Company B, 302d Engineers, in France, has been appointed by Commissioner Greene to act as his private secretary. Mr. Hyland succeeds Mr. James T. Taaffe.

After making an inspection of the road connecting the village of Carrolton, Cattaraugus County, with the Pennsylvania state line, Commissioner Greene was the guest at a dinner given by the Bradford Board of Trade.

Antonio Colorusso, of Hudson, N. Y., has filed with the State Court of Claims, a claim amounting to $22,312. This is to cover his losses during war-time construction of the Austerlitz-Spencertown Highway.

The new Albany-Rural Cemetery 16-ft. concrete road, the first highway of its kind constructed in this state during Commissioner Greene's regime, is completed and has been inspected by the commissioner.

At the New York State Highway letting on September 23, the W. T. Thayer Co., of Chateaugay, N. Y., was awarded the contract for the Carthage-Antwerp, Jefferson County, Road, for $60,839.64. DeGraff & Hogeboom, Inc., Kingston, N. Y., were awarded the contract for the Liberty-Woodburn, Sullivan County, job, for $123,802.80. Both these firms are members of the New York State Road Builders' Association.

John H. Gordon, President of the New York State Road Builders' Association, has sent out a circular letter to all its members calling attention to the fact that Nov. 7 is the last date for filing claims under the Knight Bill. President Gordon urges the members to validate their claims by filing on time even if they have not prepared the accurate figures showing the amount of their claim. The tentative claim can be subsequently changed to the correct figures.

In his quarterly report to Governor Smith, Commissioner of Highways Frederick Stuart Greene, states that during July, August and September, 102 contracts for constructing 545.59 mi. of highway at a cost of $11,596 712.28, and 7 contracts for improving 82.29 mi. of roads at prices amounting to $105,954.42 were awarded. Repair work contracts amounted to $4,440,134.29.

Nearly all of the 181 contracts abandoned at the beginning of the war have been relet.

* * *

The State Highway Commission of Oregon spent $1,714,343 during the first seven months of this year. Contracts have been awarded for more than 1,000 mi. of road at an estimated cost of $16,903,361. These contracts include work on 20 different highways and comprise 370.1 mi. of paving, 193.8 mi. of macadam and 528.6 mi. of graded roads

St. Louis County, Missouri, will spend $3,750,000 for county highways. The money will come from a bond issue of $3,000,000 and from state and federal funds. The county highway engineer has been appointed to supervise the construction of the roads, of which there will be four, partly concrete and partly bituminous macadam. Bids will be advertised during the coming winter and it is planned to start the work early in the spring.

The Pennsylvania State Highway Department has announced that bids will be received on October 31 for the construction of 119.43 mi. of state highway. The offering includes 34 projects, located in 18 counties, and calling for over 630,000 ft., one contract in Westmoreland County being for 57,683 ft. of road, and another in Bedford County being for 55,000 ft. This is said to be one of the largest collections of contracts ever offered in Pennsylvania.

MEETINGS

Calendar of Coming Meetings

Nov. 11-14—American Society for Municipal Improvements—Annual convention, New Orleans, La. Secretary Charles Carroll Brown, Valpariso, Ind.

Jan. 15-16, 1920.—Southern Appalachian Good Roads Association—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Feb. 9-13, 1920—American Road Builder's Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Apr. 12-17, 1920—United States Good Roads Association.—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Apr. 16-17, 1920—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

American Society for Municipal Improvements

The 25th convention of the American Society for Municipal Improvements will be held at the Hotel Grunewald, New Orleans, La., on Tuesday, Wednesday, Thursday and Friday, Nov. 11, 12, 13 and 14.

The morning of Tuesday, Nov. 11, will be devoted to registration and to committee meetings and the convention will be formally opened at two o'clock Tuesday afternoon. The opening session will be taken up by addresses of welcome by Mayor Martin Behrman of New Orleans and President W. B. Thompson of the World's Cotton Conference, a response by First Vice President George H. Norton of the Association, the presidential address by Elbridge R. Conant, reports of officers and committees and other business.

Technical and business sessions will be held Wednesday forenoon and evening, Thursday forenoon and evening, and Friday forenoon. On Tuesday evening there will be a theater party for the ladies and a smoker for the men. Wednesday afternoon will be given up to a boat ride around New Orleans Harbor, luncheon being served on the boat. On Thursday afternoon there will be an automobile ride through the city.

Papers and reports of special interest to road builders will be presented at the sessions on Thursday forenoon and evening and Friday forenoon. The schedule of these papers and reports is as follows:

Thursday Forenoon

Report of the Committee on Street Paving, Sidewalks and Street Design; Chairman, W. A. Howell, Newark, N. J.

Paper, "Proper Sands and Aggregates for Cement Concrete Roads," by Duff A. Abrams, Professor in Charge, Structural Materials Research Laboratory, Lewis Institute, Chicago, Ill.

Paper, "Recent Developments in Concrete Highway Construction," by A. N. Johnson, Consulting Highway Engineer, Portland Cement Association.

Paper, "Mineral Aggregates for Bituminous Pavements," by Wallace L. Caldwell, Director, Department of Roads and Pavements, Pittsburgh Testing Laboratory, Birmingham, Ala.

Paper, "Some New Discoveries in Bituminous Pavement Construction," (illustrated) by A. E. Schutte, Consulting Chemist, Warren Brothers Co.

Paper, "Roads in France and America," by Maj. Edgar A. Kingsley, consulting engineer, San Antonio, Texas.

Report of Committee on Standard Tests for Bituminous Materials; Chairman, Arthur H. Blanchard, Professor of Highway Engineering, University of Michigan.

Paper, "The Economy of Brick Street and Road Construction," by Will P. Blair, Vice President, National Paving Brick Manufacturers' Association.

Paper, "Vertical Fiber Brick Pavements," (illustrated) by Clark R. Mandigo, Consulting Engineer, Western Paving Brick Manufacturers' Association.

Paper, "Brick vs. Block for Permanent Street Paving," by S. Cameron Corson, Engineer, Norristown, Pa.

Thursday Evening

Report of the Committee on Street Lighting; Chairman, C. W. Koiner, Pasadena, Cal.

Paper, "Illuminations, Ancient and Modern, with Special Reference to Decorative Street Lighting," (illustrated by colored slides) by W. D'A. Ryan, Director, General Electric Illuminating Engineering Laboratory, Schenectady, N. Y.

Reports of Committees on Standard Specifications: Sheet Asphalt Pavements, Chairman, F. P. Smith, New York, N. Y.; Bituminous Macadam, Bituminous Concrete and Asphalt Block Pavements, Chairman, Morris R. Sherrerd, Newark, N. J.; Broken Stone and Gravel Roads, With or Without Bituminous Surface Treatment, Chairman, A. H. Blanchard, Ann Arbor, Mich.; Brick Pavements, Chairman, E. H. Christ, Grand Rapids, Mich.; Cement Concrete Pavements, Chairman, Wm. A. Hansell, Jr., Atlanta, Ga.; Stone Block Pavements, Chairman, H. H. Schmidt, Brooklyn, N. Y.; Wood Block Pavements, Chairman, E. R. Dutton, Minneapolis, Minn.; Sidewalks and Curbs, Chairman, Sylverius Sammelman, St. Louis, Mo.; Foundations for Pavements, Acting Chairman, F. P. Smith, New York, N. Y.

Friday Forenoon

Report of Committee on Traffic and Transportation, on Uniform Traffic Laws and Classification of Highways; Chairman, Maj. R. Keith Compton, Baltimore, Md.

Paper, "A National Highway System and Its Relation to Traffic and Transportation," by S. M. Williams, Chairman, Highway Industries Association and Federal Highway Council, Washington, D. C.

Paper, "Highway Traffic," by Frederic A. Reimer, County Engineer, Essex County, Newark, N. J.

Report of Committee on City Planning; Chairman, Nelson P. Lewis, Chief Engineer, Board of Estimate and Apportionment, New York City.

Paper, "Regional and Civic Planning as a Basis for Municipal Improvements," by Thomas Adams, Housing and Town Planning Adviser, Commission of Conservation, Ottawa, Canada.

Report of Committee on Parks and Parkways; Chairman, Harland Bartholomew, St. Louis, Mo.

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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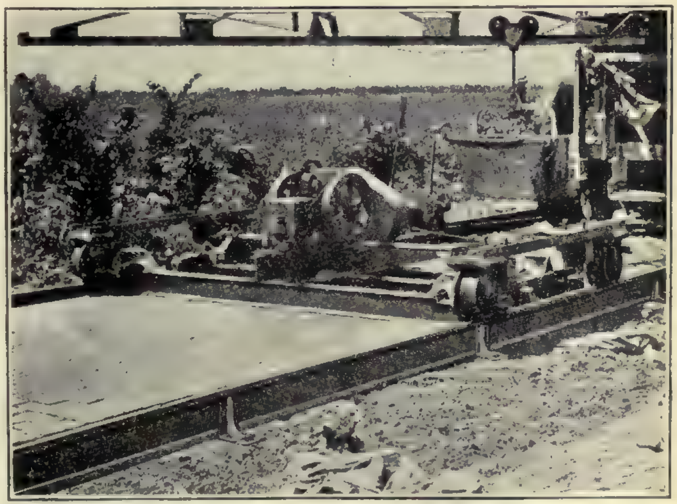

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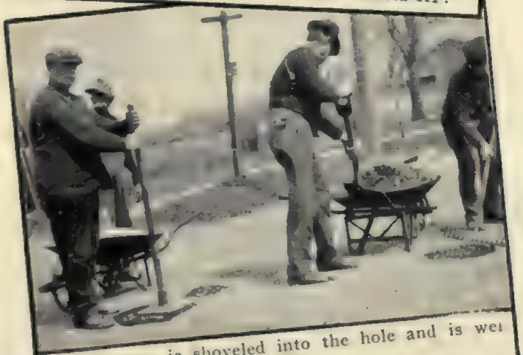

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Hard-Surfaced Roads--II*

A Discussion of Different Types of Hard-Surfaced Roads, with Especial Reference to Conditions in North Carolina---Methods of Construction and Causes of Failure of Different Pavements

By E. J. WULFF †

Two asphalt mixtures that come rather close to the sheet asphalt grading are the mixtures from which asphalt blocks are made, and what is commonly called the Topeka pavement. The former is a proprietary pavement and was formerly laid rather extensively before portable asphalt plants were used extensively. Apart from the fact that the grading is scientific, its life is shortened by the fact that the pavement is not laid as a single sheet, but in the form of blocks. The Topeka specification is an asphaltic concrete in which about 30% of stone between a ½-in. mesh and the 0.1-in. mesh is incorporated into a mineral aggregate passing a 0.1-in. mesh down to the 200 mesh. Owing to its interlocking stone content it has inherent stability that obviates the necessity of a binder course as in sheet asphalt. For this reason the pavement can be laid to a depth of 2 in., or even less, instead of 3 in., as in sheet asphalt construction.

The Topeka pavement is, therefore, more economical than sheet asphalt. The pavement is comparatively new and the results have been varying. Generally, the results have been very satisfactory where it has been recognized that the fine aggregate below the 10-mesh should resemble rather closely a standard sheet asphalt grading. The grading of the fine aggregate in what is known as the Topeka specifications will not produce a good pavement. This has been clearly recognized, and the grading below the 10-mesh has been changed to conform to sheet asphalt grading. With this change, the pavement is sometimes called a stone filled sheet asphalt or a modified Topeka. In its modified form, the pavement is laid extensively in the largest cities and under traffic conditions that place its carrying capacity with the heavy traffic requirements.

I mentioned before the failure of the granite block pavement on 42d St. in New York City. Having that failure in mind, and

TOPEKA TYPE, BITUMINOUS CONCRETE, ON GREEN BAY ROAD, LAKE FOREST, ILLINOIS

BRICK PAVEMENT ON A PENNSYLVANIA HIGHWAY IN REYNOLDSVILLE BOROUGH, JEFFERSON COUNTY.

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*Paper presented at the 20th annual convention of the North Carolina Good Roads Association, Harbor Island, Wrightsville Beach, N. C., Aug. 13-15, 1919.

†Senior Highway Engineer, Bureau of Public Roads, U. S. Department of Agriculture.

wishing to provide a pavement to meet identical traffic conditions from subway excavations in another part of the town, a stone filled sheet asphalt pavement was laid. This pavement successfully carried the heavy loads without failure. When inspected by me a year or two after the subway was completed, there was no evidence that the pavement had been damaged by loads that were presumably as heavy as the ones that destroyed the other pavement so completely. The blow that shattered both granite block and cement grouted joint, in this instance merely caused a minute readjustment of the mineral particles that is possible where a pliable material like asphalt cement is used.

The principle of a sheet asphalt grading is recognized in other types of asphalt pavement, some of which are patented. The Filbertine pavement, extensively laid in Pennsylvania, describes its fine aggregate as a sheet asphalt mixture. Its coarse aggregate passes a ¾-in. mesh and constitutes nearly 50% of the entire mass.

I do not believe that it is my function to say very much about pavements that are patented, except in a very general way.

The Bitulithic and Warrenite types are both offsprings and varieties of the sheet asphalt pavement, and their stone aggregate gives stability, by interlocking, to an otherwise not remarkable mixture. In cases of failure that have come under my observation, the failure seemed to be attributable principally to the idifferent grading of the fine aggregate. Both of these pavements, I believe, would be improved by a revision of the fine sand aggregate.

CEMENT CONCRETE PAVEMENT ON A MARYLAND HIGHWAY IN WORCESTER COUNTY.

Generally speaking, all asphalt pavements laid in the form of sheet present their best appearance if laid on a macadam foundation. By reason of the very small adjustment due to the expansion and contraction, due to temperature changes which take place in the entire surface and foundation as well, a pavement of this kind is singularly free from unsightly cracks that must inevitably appear when the pavement is laid on a rigid foundation like concrete.

Vitrified Block Pavement: This type of block pavement is extensively used, where it can be laid with reasonable economy, under traffic conditions that may be described as heavy. The largest cities do not lay it to any great extent, but in some of the medium sized cities it frequently forms the main lines of traffic. In the northern part of the country, a substantial foundation of concrete, or in the form of a macadam, is essential; in this state the pavement is occasionally laid as a monolithic slab on the natural soil. The method of construction has undergone material changes during the past few years, particularly since blocks are extensively laid on trunk line country roads.

On wide city streets where the pavement is laid between curbs, the pavement is frequently laid on a concrete foundation and a sand cushion. The pavement is grouted with a rich cement mortar and longitudinal expansion joints are provided along each curb line. Transverse expansion joints are usually omitted, but I believe should be placed at points of changing grades, and at other critical points were the expansion of the brick may cause pressures that are frequently beyond the safe crushing strength of the brick. In such cases it is of advantage to use a mastic filler for a half dozen courses of brick, instead of a cement grout. Such critical points are usually at the bottom of long grades and at vertical curves. In otherwise well laid pavements, these points have frequently been overlooked, and badly spoiled surfaces and occasionally an upheaval of large sections of the pavement are the results.

I believe that for wide streets, the sand cushion on a concrete foundation is the satisfactory method. The monolithic and semi-monolithic forms of construction have been adopted since brick have been more extensively used on country roads.

The semi-monolithic form was one of the earlier developments. Briefly described, it requires the construction of a concrete foundation with a curb or header attached. A dry sand and cement mixture, composed of one part cement and three or four parts of sand, is spread, compacted and shaped to receive the brick pavement. Expansion joints, either premolded or poured, are provided at the headers and the pavement after rolling is grouted in the usual manner.

The monolithic type of construction differs from the semi-monolithic type, in that the concrete foundation has no attached curb or header and that the pavement is laid on the green concrete, rolled and grouted in closely following operations. This type of pavement presents the strongest type of vitrified block pavement, as the concrete foundation and the brick form a single slab, acting as a unit, instead of two separate slabs. The concrete foundation in the case of a monolithic pavement need not be as deep as in the previously described forms of construction. Under favorable climatic and soil conditions, the concrete foundation course is occasionally omitted altogether and the grouted slab forms the monolith. The tendency of the present day is to reluce the depth of the paving block from the former standard of 4 in. to 3½ and 3 in. A comparatively recent innovation from the formerly repressed block consists of the cut lug block. This type of block is particularly well adapted to monolithic and semi-monolithic pavements, as the roughness of the wire-cut lugs offers a much better bond to cement grout than the much smoother surfaces of the repressed block.

An important feature of the vitrified block pavement consists of the hardness of the block itself, and this is determined by the rattler test. It is evident that in firing the brick, the entire product of the kiln is not of a uniform hardness, for the reason that an absolutely uniform heat cannot be maintained in the kiln. Of the product of the kiln, the hardness represented by a rattler test of 22 is best adapted for use on roads where heavy traffic is of only occasional occurrence.

City streets require a hardness of 18; the softer block of about 24 rattler test should not be laid on roads where traffic is likely to be heavy. The crushing strength, while not appearing as a standard test, has a distinct bearing on the value of a brick pavement. Where heavy service is required, a brick should be selected that shows high resistance to crushing. The crushing strength of various bricks, varies from 8,000 to 15,000 lb. per square inch, and it is only reasonable

(Continued on Page 198.)

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

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Managing Editor

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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIII OCTOBER. 29, 1919 No. 18

THE RELATION BETWEEN THE ENGINEER AND THE CONTRACTOR

There has always been more or less friction between the engineer and the contractor. Since both are human, there probably always will be; but there is no good reason why it should not be much less than it too frequently is. In these times, especially, when production is the greatest need of the world, there is every reason why everything possible should be done to bring into a better understanding these two very important members of the industrial family.

In highway work—with which we are particularly concerned—the reasons for the existing conditions are not difficult to find. Very often the engineer is a little too conscious of his authority and apt, upon occasions, to exert it to the limit—and sometimes beyond. The contractor, on the other hand, is naturally prone to resent what he regards as the assumption of too much authority by the engineer and to feel that he is imposed upon by some of the engineer's demands. Moreover, where the work is being done by a contracting organization so small that the contractor himself is in direct charge of the work, there is always to be reckoned with that peculiar sort of snobbery manifested in the attiture of the man "in business for himself" toward the salaried employee.

The differences between the engineer and the contractor on a road job are almost certain to be aggravated by the usual specifications. Ordinarily these stipulate that work is to be performed "to the satisfaction of the engineer," and it is easy to understand how this may become a cause of dissension. Though it is necessary that the engineer, as the representative of the owner, should be the judge of the acceptability of the work, it should not be necessary to delegate to him absolute authority over the contractor in the matter of methods used to accomplish the desired results. In other words, instead of attempting to make the specifications cover details of methods to the most minute detail, and then providing for unforeseen details by giving the engineer blanket authority over them, the specifications might better explicitly describe the results to be obtained and leave to the contractor the greatest possible latitude in the matter of methods.

Such specifications would go far towards clarifying the existing situation and bringing about more cordial relations.

LABELING ROADS

Why would it not be to the advantage of all concerned to erect alongside improved roads a sign designating the kind of pavement, the date it was put down and the name of the contractor? This suggestion was recently made by a man who has had a life-long experience in road work, and it seems worthy of consideration, for there are several points obviously in its favor.

In the first place, it would inform the traveling public as to the various types of surfacing in use. To the average layman, the different kinds of hard-surfaced roads look much alike. He can see a difference between a brick pavement and a bituminous concrete pavement, but he can not always distinguish between brick and asphalt blocks nor between bituminous and cement concrete. He knows a granite block pavement when he sees it, but he does not differentiate between surface treated water-bound macadam, bituminous macadam and bituminous concrete. And even the experienced engineer is often at a loss to distinguish between the various types of bituminous concrete and bituminous macadam.

The date of construction, it would seem, would also be valuable information in many cases, for the condition of a pavement signifies little unless its age is known.

Giving the name of the contractor has obvious advantages, chief of which, of course, is that it would result in fixing the responsibility for the work. This would stimulate effort and eventually result in better workmanship.

While the original suggestion provided for only the information noted—type of road, date of construction and name of contractor—it might be well to include additional data, such as the name of the engineer, the cost of the pavement, exclusive of grading and incidental work, some statement as to the volume and character of traffic, and perhaps an indication of the kind and cost of maintenance.

Giving the engineer's name would have the same advantages as giving the name of the contractor. A statement of the cost, if accompanied by sufficient information to give it real meaning, would be valuable in bringing to the public a realization of the amount of the investment made and the return yielded. The bearing of the traffic statement and the maintenance data are equally obvious.

The principal objection to the plan is the danger of not giving sufficient information to make possible a fair judgment. The cost, for instance, might be unduly high because of circumstances over which neither party to the contract had any control. Again, it might well happen that a road built most conscientiously by the best methods might have disintegrated because not properly maintained, in which case the information given would do an injustice to the type of pavement, to the engineer and to the contractor. This is possibly the strongest argument against the proposal. Another argument against the plan is that it might not infrequently be the case that the engineer was working under orders or conditions that made the performance of good work impossible. Such cases are by no means rare, for the "man higher up" sometimes has an axe to grind—an axe that is not used in the interests of the public.

On the whole, we believe the suggestion to be good. Its application would necessitate the solution of a great many problems, chief of which would be to determine just how far to go. Naturally, all the data suggested would be required by an engineer to form a correct judgment, but much less would probably suffice for the education of the public. There is plenty of room for discussion of the exact information that should be placed on a sign such as suggested, and "Good Roads" will gladly lend its columns to such discussion.

Proposed Paving Program in St. Louis County, Missouri

Brick and Asphaltic Paving at a Cost of over $2,000,000 Proposed by State Highway Engineer and Automobile Club President—Oppose County Court Plan

A plan for paving the four state highways in St. Louis County, Missouri, with either brick or asphalt has been prepared by State Highway Engineer A. W. Graham and Harry B. Hawes, President of the Automobile Club of St. Louis, and has been presented to the County Court.

The highways included in the scheme are the Le-May Ferry Road, the Manchester Road, the Gravois Road and the St. Charles Road. According to the proposition laid before the court, the Le-May Ferry Road would be paved with concrete and the Manchester Road with a 20-ft. asphaltic concrete pavement to the Denny Road, with an 18-ft. asphaltic concrete pavement from the Denny Road to Ellisville, and with asphaltic macadam from Ellisville to the Franklin County line. The Gravois Road would be paved with brick to the foot of the Sunset Road and with asphaltic concrete over the remaining length. The St. Charles Road would be paved with brick from the city limits to the Lockland Road and with asphaltic concrete to the St. Charles Bridge. The cost of the work is estimated at $2,250,308.

This plan was proposed as a counter proposition to that made by the County Court, which provided for paving only those parts of the roads carrying the heaviest traffic. The cost of carrying out this plan is put at $1,717,657, of which $815,100 would be paid from state and federal funds.

The plan submitted by Messrs. Graham and Hawes contemplates the use of $1,259,939 from the county's $3,000,000 bond issue and $990,369 from state and federal funds.

Hard-Surfaced Roads

(Continued From Page 196.)

that the latter crushing strength is more nearly adapted to the heavier traffic conditions as they develop normally.

I have covered the subject of brick pavements in a rather sketchy manner for the reason that the state of North Carolina does not cover that type of construction in its "standard specifications" at the present time. However, there is no reason to assume that this type of pavement may not be laid in the future by the State Highway Department.

The type of pavement that has taken the largest strides forward during recent years, is cement concrete pavement. Until a comparativelyy short time ago, concrete in road construction was generally used almost exclusively for foundation purposes, or for structures, but since the destructive effect of automobile tires played havoc with water-bound macadam roads, macadam built by the penetration of bituminous material into the interstices of the stone aggregate, and cement concrete pavements, have replaced water-bound macadam to a considerable extent. The earlier attempts were, in many cases, not very successful, but more recently changed methods of construction have resulted in material improvements.

The essential changes which have contributed to these results are the following: The amount of cement in the concrete has been materially increased from the older practice. While foundation concrete is ordinarily mixed in the proportion of 1 part cement, 3 parts of sand and 6 parts of coarse aggregate, it is now customary to mix surface pavement concrete in the proportions of 1 part cement, 1½ parts sand and 3 parts of coarse aggregate. In other words, the cement content has been nearly doubled. This is at least the practice where climate and soil conditions subject concrete to the most severe tests.

Where climatic conditions are more favorable, a mixture of 1 part cement, 2 of sand and 4 parts of coarse aggregate are still employed, and in many cases a thin asphaltic carpet protects the concrete from the immediate impact of traffic. The depth of the pavement has also been materially increased. This was found necessary, partly by reason of poor soil and drainage conditions and partly on account of the greater loads that are now imposed upon the pavements.

The one change that has more than any other contributed to the improvement of the pavement and its power to withstand heavy traffic, consists of the better finish of the surface. While even the better class concrete pavements of former years showed marked irregularities of surface, the new methods produce a surface that is practically free from irregularities—depressions or projections. This is a very important point, for the following reason: All other conditions being equal, a surface free from irregularities offers less points of attack than one of irregular surface finish. It allows a heavily loaded vehicle to roll along at fairly good speed without the destructive impacts that would result in the early disintegration of concrete if the surface were uneven.

In my remarks I have purposely not gone into the details of construction or the depth of foundations that will be necessary under varying conditions. My remarks are chiefly intended to be an interpretation of the principles that should govern the construction of hard-surfaced pavements and, incidentally, the making of them as nearly permanent as the different materials permit them to be.

Indiana State Highway Program

State Highway Commission Plans to Build 300 Mi. in 1920—Contracts for over 130 Mi. Awarded in 1919

Surveys, plans and specifications for approximately 300 mi. of state highways are being prepared by the Division of Construction of the Indiana State Highway Commission under the direction of Chief Engineer H. K. Bishop. Several parties are at work making surveys and about 100 men are engaged in work on plans and specifications.

No definite date has been set for letting the contracts, but it is expected that awards will be made between Jan. 1 and March 1, 1920. In addition, contracts for several bridges of over 20 ft. in span will probably be advertised during the latter part of December and the early part of January.

While the commission's program for 1920 comprises the 300 mi. mentioned, the amount of work accomplished will depend upon the funds available after the tax levy has been set by the State Board of Tax Commissioners. The Highway Commission hopes to have the levy fixed at the maximum, in order to be able to meet the federal aid apportionment.

During the present year the State Highway Commission has awarded contracts for the building of 133.3 mi. of state highways, involving a total expenditure of approximately $4,300,000. The program for 1920 calls for the construction of more than double the 1919 mileage.

The Commission is also planning the establishment of a division of maintenance to take care of the state roads after their completion by the construction division.

———ooo———

Eastland County, Texas, recently voted a road bond issue of $4,500,000. As a result of the election, the good roads of the county will be extended to all parts of the oil fields and will provide the county with one of the best road systems in the state.

EQUIPMENT---TRADE---MATERIALS

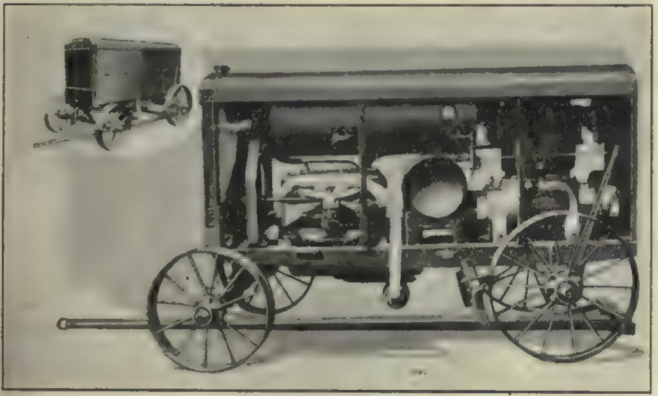
Portable Compressor of New Type

A new portable air compressor designed particularly for road contractors and others requiring air power for construction equipment is shown in the accompanying illustration.

The machine consists of a gasoline driven engine and air compressor mounted upon an all-steel truck and enclosed with a steel cover, as shown in the small inset in the upper left-hand corner of the illustration.

The machine is built in two sizes, the one illustrated having a capacity of 210 cu. ft. and weighing 6,000 lb. The other has a capacity of 118 cu. ft. and weighs 4,000 lb.

The compressors have cylinders cast en-bloc, with cylinder heads, valve chambers and water-jackets integral. The air pistons are fitted with three-piece piston rings and with an oil wiper ring which returns all surplus oil from the cylinder walls to the crank case. All parts are splash lubricated from an oil reservoir in the crank case. The compressors are provided with inlet unloading devices which automatically close the intake when the receiver pressure rises above a predetermined limit and permit the machine to take up its load again when the pressure has fallen to a certain point.



IMPERIAL TYPE 14 PORTABLE COMPRESSOR

The driving motor is of the long stroke type and operates at medium speed. It is equipped with high tension magneto ignition, with an automatic governor and with a splash oiling system.

Both compressor and driving motor are water cooled. The water is forced through a large radiator by a centrifugal pump, the radiator being made up of removable sections which permit repair without taking down the entire radiator or interfering with the use of the compressor.

The machine is mounted upon a truck fitted with a swivel front axle which moves freely in both the horizontal and vertical plane. The rear axle is rigdly attached to the frame, giving the machine a three-point suspension and permitting it to pass over inequalities of the ground with a minimum strain upon the working parts.

The two sizes of machines are similar except for the location of the air receiver and minor details in the design.

The compressor is known as the "Imperial Type 14 portable compressor," and is manufactured by the Ingersoll-Rand Company, of New York, N. Y.

New Truck Dumping Body

A truck dumping body designed especially for use in road building work is shown in the accompanying illustration.

The body is built of 3-16-in. steel plates, reinforced with angles and equipped with a hoist, pivot brackets and a steel runway, as shown. The body is 7 ft. 6 in. long, 4 ft. wide and 1 ft. 4 in. deep, inside measurements, and has a capacity of 42 cu. ft. or 1¾ cu. yd. when filled level full. The body can be operated from the driver's seat, the tail gate being automatically released when the body is dumped and automatically closed when the body is brought back to the normal position.

AMERICAN ROAD BUILDING DUMP BODY IN OPERATION.

Among the advantages claimed for the body are that it is low, thus permitting easy loading; that the driver can operate it without leaving his seat and that it can be easily attached to any chassis. The shipping weight is about 1,200 lb.

The body is known as the "American road building dump body," and is manufactured by the American Truck Body Co., of Martinsville, Va.

Tractor for Road Maintenance

Comparative Costs of Grader Maintenance in Cherokee County, South Carolina, by Kerosene Tractor and by Mule Team Power

The County Highway Commission of Cheroke County, South Carolina, uses a tractor and also an 8-mule team for operating road machines in the maintenance of the county highways and has kept careful records of cost by the two methods. According to H. C. Hughes, Jr., the former engineer of the Commission, neither a tractor outfit nor a team outfit should be used alone, the best results being obtained when both are employed, since there are certain conditions in road maintenance which can not be met by either one alone.

LAUSON TRACTOR IN ROAD MAINTENANCE

The following cost data are taken from the daily cost and progress card of the Commission:

Tractor Outfit: One 15-25 tractor, 2 7-ft. blade road machines.
Progress: Machines, 9 mi. four breadths of blade in 10-hour day.
Operation cost per diem based on 24 work days in 30-day month:

Kerosene, 20 gal. at 15 cents	$ 3.00
Gasoline, 1 gal. at 26 cents	.26
Oil, 1 gal. at 75 cents	.75
Interest on equipment	1.00
Repairs	1.00
Engineman	3.50
Machine operators: 1 at $4.50, 1 at $3.00	7.50
Total cost per diem	$17.01
Cost per mile at 9 miles per day	$ 1.89

Eight mule Outfit: Eight mules, 2 standard road machines.
Progress: Machines 10 mi. four breadths of blade in 10 hours.
Operation cost per diam, based on 24 work days in 30-day month:

8 mules at $1.25	$10.00
2 drivers at $2.50	5.00
Interest on equipment	1.00
Repairs and shoeing	1.80
Machine operators: 1 at $4.50, 1 at $3.00	7.50
Total cost per diem	**$25.30**
Cost per mile at 10 miles per day	$ 2.53

When using a three-way drag or leveler:
The tractor will cover 9 mi. twice over in 10 hr.
at a cost per diem of $12.01.
at a cost per mi of 1.334.

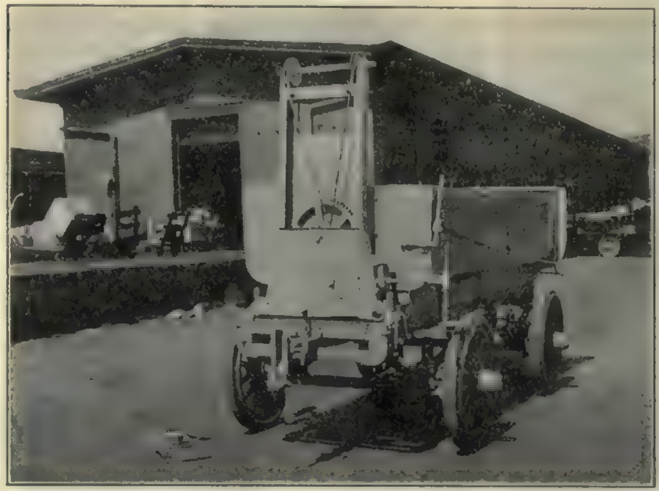
A 6-mule outfit will drag 10 mi. twice over in 10 hr
at a cost per diem of $18.00.
at a cost per mi. of 1.80.

The machine used was the Lauson tractor manufactured by the John Lauson Manufacturing Company of New Holstein, Wis.

Hand Hoist for Truck Bodies

A hand-hoist for dumping motor truck or trailer bodies is illustrated herewith, attached to a trailer with the body in the normal position.

The hoist consists of a steel frame carrying an axle with two sheaves at the top and an enclosed gear-driven drum at the bottom, with a steel cable. The gears are of the spur and bevel type, the ratio being such as to enable one man to raise a 5-ton load to an angle of from 30 to 50 deg. in something less than 2 minutes. The apparatus occupies a space of about 8 in., directly back of the driver's seat on a truck, and can be attached to any truck or trailer chassis in a short time and without drilling the frame.



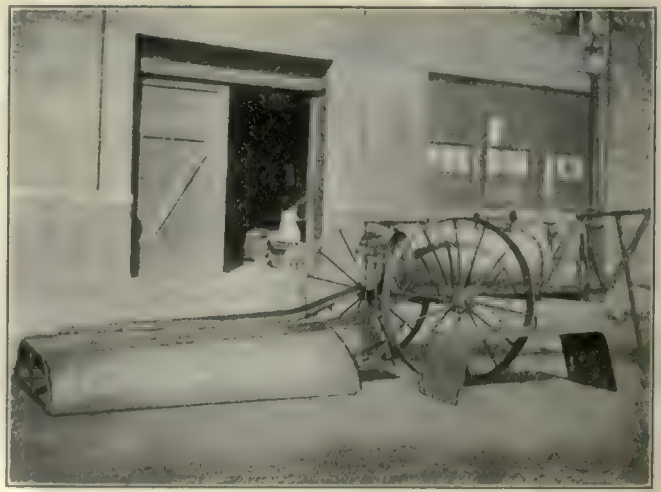
COLUMBIAN HAND-HOIST ON A TRAILER

It is known as the "Columbian" hand-hoist, and is manufactured by the Columbian Steel Tank Co., of Kansas City, Mo.

New Asphalt Surface Heater

The accompanying illustration shows a new type of asphalt surface heater made by the Hauck Manufacturing Co., of Brooklyn, N. Y.

The heater is equipped with Hauck patent vaporizing burners, utilizing kerosene as fuel, and operated individually. The largest size of machine has a heating hood 48x72 in. and is equipped with two oil supply tanks. The use of the two tanks permits continuous operation, as the flame can be maintained while one of the tanks is being filled. The hood is reinforced and equipped with a double shield, the frame being of angle iron.



HAUCK ASPHALT SURFACE HEATER

Knox Motors Company Sold

The Knox Motors Co. has just announced the sale of its plant at Springfield, Mass., to Neil R. Sinclair, of New York, N. Y., President of the Militor Motors Corporation.

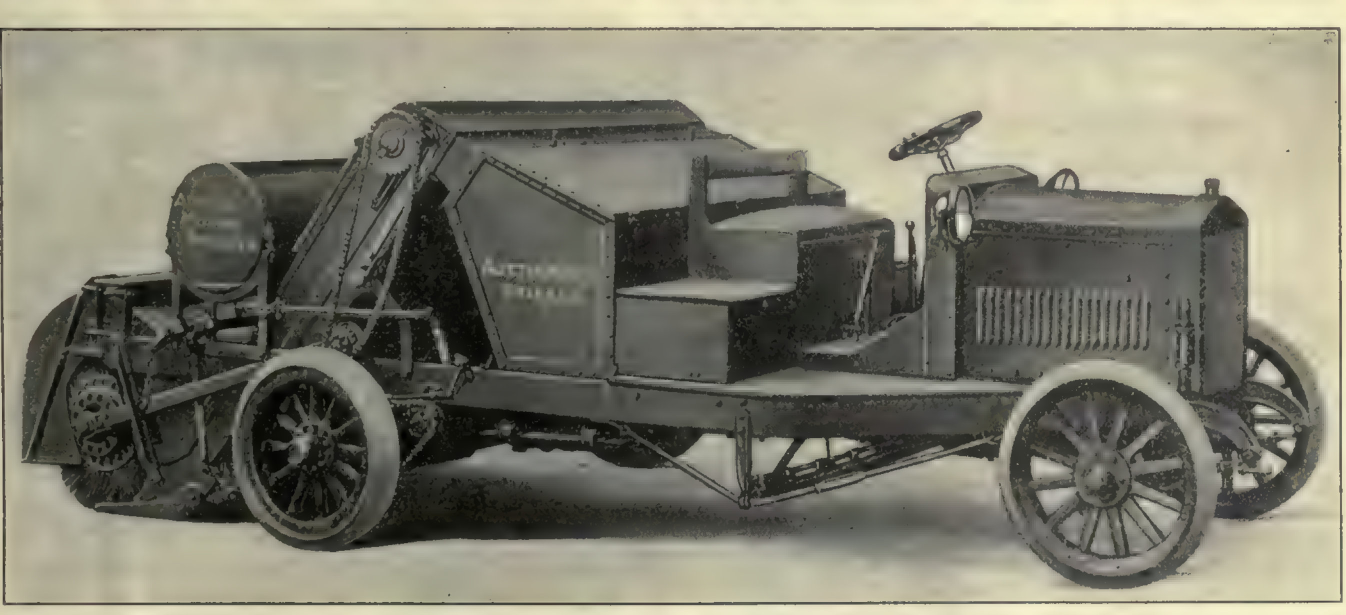
In disposing of the plant, however, the Knox Motors Co. has reserved the right to use a part of the buildings for two years where the manufacture of its present products, as well as parts for its former models, will be continued.

New Motor Sweeper

A new motor sweeper designed especially for use on paved streets is shown in the accompanying illustration.

The machine consists of a specially designed truck chassis, water tank and sprinkler system, a revolving broom, a conveyer and a hopper or dirt container. The chassis is made up of standard units. The frame consists of 6-in. channels with 4-in. cross members and is mounted on wheels equipped with solid rubber tires. The motor is a 4-cylinder, 4-cycle model of Buda make with geared pump and force feed lubrication system. The radiator, transmission, carburetor, magneto and other accessories are all of standard makes.

The water tank has a capacity of 150 gal. and discharges by gravity to a gear-driven force pump. The pump forces the water out through eight brass nozzles situated just forward of the driver's seat and about 14 in. above the pavement. One tank of water will suffice for about 2½ mi. of sweeping under average conditions.



AUSTIN MOTOR SWEEPER

The broom is 36 in. in diameter and 7 ft. in length, and is suspended upon two long coil springs with an adjustment permitting the operator to regulate the pressure upon the pavement. The broom can be driven at two speeds, the higher for use when the streets are unusually dirty or when the broom has been worn down. Throwing the broom into high speed automatically speeds up the conveyor and the water spray pump, the three being driven from the same shaft.

The conveyor mechanism consists of a steel sheet inclined plane upon which the dirt is thrown by the broom, and a series of rubber squeegees, carried on steel chains, which carry the dirt up the inclined plane and into the hopper.

The various controls are situated within easy reach of the operator, the driving controls being the same as those of the ordinary motor truck.

Some of the claims made for the machine are that the placing of the driver's seat in front of all the working parts permits an unobstructed view of the traffic; that the spray has enough force to moisten the dirt but not sufficient to plaster it on the pavement; that the housing of the broom prevents splashing, and that the dirt swept into the machine is completely enclosd until it is dumped.

The sweeper is known as the "Austin" motor sweeper, and is made by the Austin Manufacturing Co., of Chicago, Ill.

Chair Belt Expansion

The stockholders of the Chain Belt Co., of Milwaukee, Wis., recently voted to increase the capital stock of the company from $1,000,000 to $2,000,000, and the company has undertaken the construction of a new plant on a 23-acre site at 39th and Orchard Sts. The building operations are to progress by departmental units as rapidly as possible, and it is expected that the entire undertaking will be completed in a short time. The company's plans contemplate the ultimate removal of the business from its present plant at 16th and Park Sts.

The first unit constructed will be a steel and brick building 316x150 ft. to house the concrete mixer assembling department. The entire project is under the supervision of Frank B. Chase, Inc., of Chicago, one of the foremost industrial engineering concerns of the country.

The Chain Belt Co. was established in 1891 by C. W. Levalley who was then 58 years old and was making a new start after having experienced one failure. The first work was done in a small shop at the corner of Clinton and Lake Sts. with a working force of three men, including Mr. Levalley himself. The business was moved to the present site in the autumn of 1902, when what is now the office building was erected. In 1891 the capitalization of the company was $11,100; in October, 1895, it was increased to $50,000; in 1907 to $500,000 and in July,, 1916, to $1,000,000.

During most of the period between 1891 and 1916, Mr. Levalley served as president of the company, but retired in 1916 to become chairman of the board. He died in 1918. William C. Frye, who succeeded Mr. Levalley as president, has been with the company since he was 17 years old. He was elected treasurer in 1907 and served in that capacity until he succeeded Mr. Levalley in 1916. C. R. Messinger is vice president and general manager of the company; W. C. Sargent is the secretary and C. L. Pfeifer is the treasurer.

The Chain Belt Company's best known products in the road building field are the "Rex" concrete pavers and the "Rex" concrete mixers.

New Tire Chain

A quickly detachable tire chain of a new type has recently been patented and put on the market by the Bear Manufacturing Co., of Rock Island, Ill.

The chain consists of four sections and can be put on and taken off without the use of a jack or other tools. It is claimed by the manufacturers to be the only one which can be attached when the wheels are mired.

Hydrated Lime Experiment in New York State

An experiment in the use of hydrated lime in concrete pavements is being made by the New York State Highway Department on a road near Buffalo.

The work will consist of the construction of alternate slabs with and without lime, the slabs being 30 ft. long, which is the standard length in the state. The Lime Association, which is cooperating in the work, is represented by T. B. Shertzer, Eastern District Engineer.

Plans are being made to conduct similar experiments in the eastern part of the state.

East Iron & Machine Company Acquires Van Wie Pump Company

The East Iron & Machine Co., of Lima, Ohio, has just announced the purchase of the business of the Van Wie Pump Company of Syracuse, N. Y., successor to the Baldwinsville Centrifugal Pump Co.

The business of the Van Wie Pump Company was established at Baldwinsville in 1860 and was first conducted by White, Clark & Co. Later, the name was changed to the Baldwinsville Centrifugal Pump Co., and in 1880 the factory was moved to Syracuse. In 1905, the company was incorporated as the Van Wie Pump Co. The line manufactured includes vertical and horizontal centrifugal pumps, double suction pumps, sand pumps, hydraulic dredge pumps and various other types, and also vertical steam engines.

The East Iron & Machine Co., which was established in 1903, will immediately commence the manufacture of the entire Van Wie line at its Lima plant. The company is also the manufacturer of the Merriman steam melting asphalt plants.

The Four Wheel Drive Auto Co., of Clintonville, Wis., manufacturer of the FWD trucks, has made an addition to its plant. A large quantity of new machinery has been ordered and is rapidly being installed. The company also reports rapid progress on its new Canadian plant which, when completed, will relieve the Clintonville factory of all Canadian business.

"Concrete Streets for Your Town" is the title of a 24-page booklet issued recently by the Portland Cement Association. The text is devoted to a discussion of the necessity of well paved streets, the demands of motor traffic and the merits of cement concrete for city pavements. It is profusely illustrated by views of concrete pavements in many American cities.

"Profit Sharing and Bonus Systems" is the title of a 57-page booklet issued by the Troy Wagon Works Co., of Troy, O. The booklet contains a number of complete articles on the application of profit sharing and bonus systems to passenger and freight hauling by motor-driven vehicles. Many of these articles are by men in responsible charge of the business of hauling and storage companies.

The Packard Motor Car Co., has announced the opening of a new parts supply depot at Atlanta, Ga. This depot will handle business in Tennessee, North and South Carolina, Alabama, Mississippi, Georgia, Florida, eastern Louisiana and portions of Virginia and Arkansas. The depot will be desgnated as the Soutehrn Parts Supply Depot and will be in charge of R. J. Henderson of the Packard Company.

According to the Nash Motors Co. of Kenosha, Wis., the motor trucks which the Government is distributing to the states for use in road work include 7,000 Nash Quads. These machines were built for the Army, and while some of them have been used in various cantonments, others are to all intents and purposes new. The total number of trucks to be distributed by the Government is approvimately 20,000.

MEETINGS

Calendar of Coming Meetings

Nov. 11-14—American Society for Municipal Improvements—Annual convention, New Orleans, La. Secretary Charles Carroll Brown, Valpariso, Ind.

Jan. 15-16, 1920—Southern Appalachian Good Roads Association—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Feb. 9-13, 1920—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Apr. 12-17, 1920—United States Good Roads Association.—Eighth Anual Convention, Hot Springs, Ark. Director General J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Apr. 16-17, 1920—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

PERSONAL MENTION

Hess & Tyler have been appointed highway engineers for Tyler County, Texas.

Orville Work, of Winnie, has been appointed engineer of Chambers County, Texas.

G. Wheat, of Rock Springs, has been appointed county engineer of Edwards County, Texas.

A. B. Axtell, of Willis Point, has been appointed county engineer of Rains County, Texas.

Harry Nolen, of Austin, has been appointed engineer of Travis County, Texas, succeeding O. E. Metcalf, resigned.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE
WITH WHICH IS INCORPORATED
THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series. Vol. LVII.
New Series, Vol. XVIII

NEW YORK, NOVEMBER 5, 1919

Number
19

Impact of Trucks Upon Road Surfaces*

Preliminary Report on Experiments Being Carried on by the Bureau of Public Roads to Determine the Effect Upon Road Surfaces of Motor Trucks Running at Various Rates of Speed

By E. B. SMITH and J. T. PAULS†

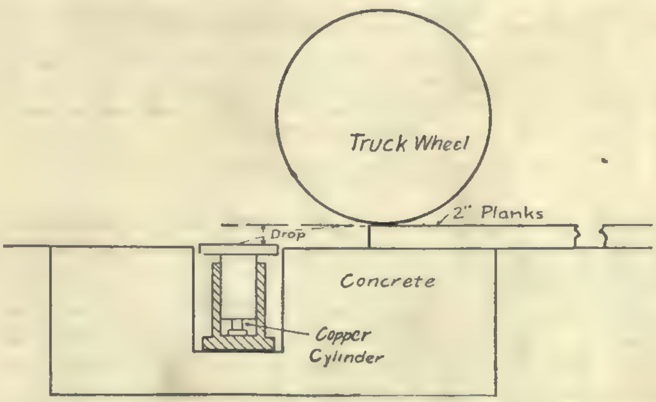
Realizing the destructive effect of heavily loaded auto trucks on highways and streets, and the demand for data on the design of road surfaces and foundations to withstand such heavy traffic, a series of experiments is being conducted by the Bureau of Public Roads at the Arlington Experimental Farm to determine the impact of auto trucks on roads.

The apparatus used in these experiments consists of a heavy steel cylinder in which is fitted a plunger 4 in. in diameter and 8 in. long, similar in construction to a hydraulic jack. A hole is left in the bottom of the cylinder in order to prevent air cushioning under the plunger. On the top or head of the plunger there is securely fastened a heavy steel plate, on which the impact of the truck wheel is received. This whole apparatus is supported rigidly in a concrete box placed in the road in such a position that the height of the steel plate on top of the plunger may be made just flush with the road surface. The height of the upper surface of the plate can be varied by proper steel disks placed under the plunger. In order that the front wheel may pass over and not touch the steel plate on the plunger, a steel bridge is used which is automatically tripped by the front wheel in passing over it. This releases a catch and allows a weighted lever to pull the bridge clear from the apparatus, thus leaving the steel plate exposed and ready to receive the impact of the rear wheel. By slight variations this bridge may be used to allow the impact of the front wheel to be received and then protect the plate from the impact of the rear wheel. The approach to this impact apparatus is made of 2-in. planking about 20 ft. long, and is so constructed that the height of the planks may be varied above the road surface to give various heights of drop, and also can be moved forward or backward to give the proper jumping distance from the jump-off point so that the wheel will strike the center of the plunger at all speeds.

Recording the Impact Value

For recording the impact value, a copper cylinder ½ in. in diameter by ½ in. long is placed under the plunger of the jack. The impact received on the plunger is transmitted to the copper cylinder, where it produces a corresponding permanent deformation. The copper cylinders for this investigation are prepared from pure copper bars and are carefully machined to dimensions. They are then annealed by heating for 30 min. at a uniform temperature of 650° C. in a bath consisting of a mixture of 20% potassium nitrate, and 80% sodium nitrate, followed by cooling slowly in the air at room temperature. This treatment anneals the copper very uniformly. The finished cylinders are tested for uniformity in a universal testing machine under a pressure of 6,000 lb. total static load, five cylinders being taken from each heat-treated lot. Thus far the maximum variation from the mean deformation value has been only 1.2%, and this is less than other experimental errors.

A 3-ton U. S. A. class B truck with solid rubber tires was used for these experiments. The weight of the truck empty is 11,400 lb.; weight on front wheels, 4,550 lb.; weight on rear wheels, 6, 850 lb.; weight of unsprung rear parts, 3,675 lb.



SKETCH OF IMPACT MEASURING APPARATUS

Deflection of rear spring under weight of body alone is 0.74 in. Weight on rear wheels when loaded with 7,200 lb. (3.6 tons) gravel is 13,100 lb.; deflection of rear spring, due to load and body, 2.62 in. Weight on rear wheels when loaded with 10,000 lb. (5 tons) gravel is 15,500 lb.; deflection of rear spring, due to load and body, 3.62 in. Diameter of rear wheels is 40 in., each fitted with two solid rubber tires, and each tire is 6 in. wide at the base next to the rim. Impact values were obtained only for the rear wheel, as it was the object to obtain values of the maximum impact of the truck. Rear springs were 57½ in. long, 4 in. wide, 6½ in. deep, wth 17 leaves.

The Test Conditions

The impact condition under which these tests were conducted was the simple falling of the truck wheel from one level to another at different speeds of the truck, the height of drop varying from ¼ to 3 in. Other conditions of impact will be investigated later. The magnitude of the impact is dependent upon: (1) height of drop, (2) weight of truck and load, (3) kind and condition of tires, (4) characteristics of springs, and (5) speed of truck. Under these conditions, a series of tests was run, and the results are shown on the accompanying curves.

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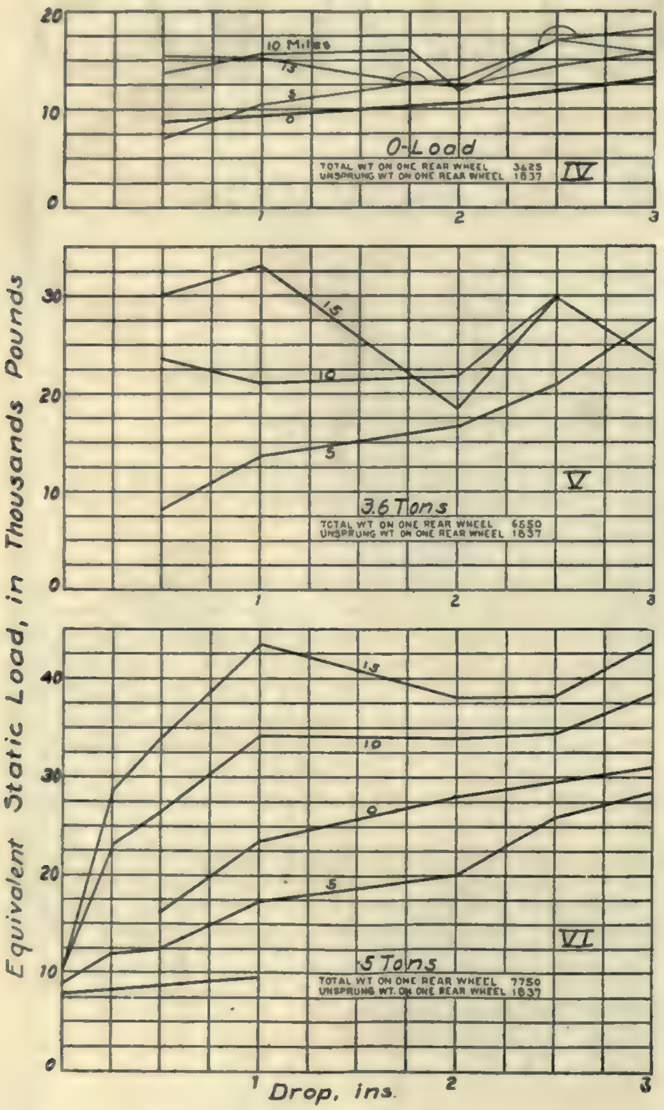
*From "Public Roads," the official publication of the Bureau of Public Roads. U. S. Department of Agriculture.

†Senior Assistant Testing Engineer, and Highway Engineer, respectively, Bureau of Public Roads.



CURVES IV, V AND VI

The impact, while measured by the shortening or compression of the copper cylinders, is shown in equivalent static load. That is, for each compression value of the copper the static load has been determined which would produce the same compression. All the curves are thus shown with the equivalent static load as ordinates. This may not be a perfect comparison of impact loads, as loads applied with impact will probably produce a much localized shattering effect which does not result from the application of an equivalent static load. For this reason, the present method of comparing impacts by their equivalent static loads must be considered as tentative and subject to possible revision as the tests proceed.

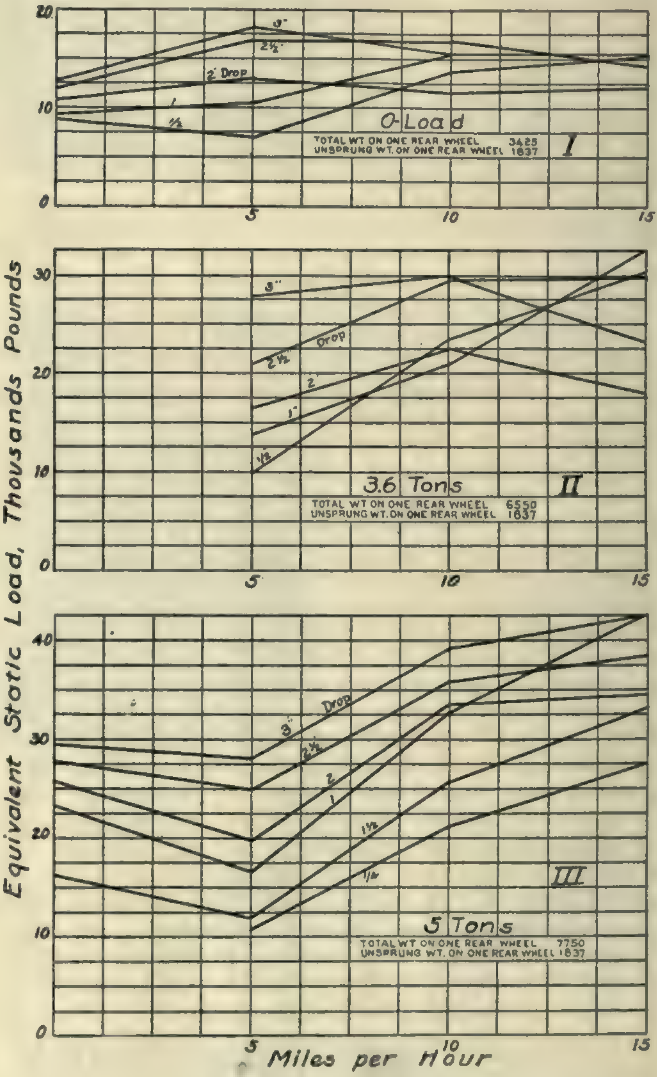
Elements of Destructive Effect

The tests thus far give only the relative impact values and do not attempt to demonstrate the destructive effect of these impacts. The destructive effect depends upon the road surface, the type of construction, and the foundation, and to arrive at the destructive effect of these impact forces, it is proposed in another series of experiments to subject certain road surfaces to these same impacts repeatedly until failure occurs. Machinery and apparatus for this purpose are now under construction.

The results as shown in curves I, II, and III indicate a general tendency of increased impact toward the higher speeds, although the increment of increase is less as the speed increases. The relatively high impact values at zero speed, as shown in curve III, are explained by the fact that the results were obtained by dropping the wheel vertically upon the impact plunger, which resulted in the copper cylinder receiving, first, the impact, or kick of the spring, then an additional load an instant later from the falling of the truck body and load. Curves IV, V and VI show the same data plotted with height of drop as abscissae. These curves indicate a general increase of impact with the increase of height of drop.

Springs Have Great Influence

In conducting these experiments it was soon discovered that the action of the truck springs had a great influence on the impact results. When the wheel leaves the jump-off point the spring snaps open and produces a greater downward acceleration of the unsprung parts than that due to the action of gravity alone. If the compression of the spring is "e" and the height of the drop or jump-off point is "d," then



CURVES I, II AND III

(Continued on page 206)

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
Editor

T. A. HULBERT
Managing Editor

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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIII NOVEMBER. 5, 1919 No. 19

THE BEST ROAD

Not infrequently—though less often than formerly—some one asks: What is the best road? The question always comes from a layman, of course, and the fact that it is asked, even after years of "good roads propaganda," shows conclusively that there is real need for continued efforts to educate the people on this very important matter of public policy.

Because the question is so often asked in all sincerity, there can be little doubt that it seems a fair and reasonable question to the interrogator; and some years ago it might have been reckoned a fair question, for at that time only a few types of surfacing were used on country roads and traffic requirements were simple. That it cannot be answered now is thoroughly understood by road builders, though a few of them seem to have been led to believe that some one particular type is better than any other.

Some part of the blame for the public's lack of comprehension of the fact that the selection of the type of road to build in a given case is a matter of nice balancing of various considerations must be laid at the door of the promoters of various pavements and materials of construction. All of the modern types of pavement surfaces have their uses, but none of them is the one pavement for all cases. It is to be expected that the concern interested in marketing a certain pavement, or a material used only in a given type of pavement, will do everything it can in a legitimate way to further the use of that pavement or material. But it is certain that in the end the advocacy of any pavement for use under conditions calling for something very different will react to the disadvantage of the promoter. Fortunately for the public and for the paving industry, such cases have been few in number.

It is often charged that engineers are too backward in seeking publicity for their work, and there is a measure of truth in the accusation. Though the engineer is better fitted than anyone else to undertake the educational work necessary to put the general public in possession of the facts it ought to have, he is too often content to leave that work to others who lack the necessary knowledge to speak with authority. This is particularly regrettable in the case of road work ,for the funds to build the roads come from the people—in a very direct way, in large measure—and it is highly important that the people who furnish the funds should be in a position to appreciate the manner in which their money is spent. Highway engineers and highway officials ought to put forth their best efforts to give the people the essential facts and to counteract the influence of those who through ignorance or malice speak and write nonsense about roads and road building.

TRUCK IMPACK TESTS

Experiments that may be expected to yield very valuable results have been undertaken by the Bureau of Public Roads. They have for their object the determination of the effects of the impact of motor trucks upon road surfaces and are described in considerable detail in an article on other pages of this issue.

As soon as the horse-drawn, steel-tired vehicles that formerly made up practically all of the traffic upon the country roads and city streets began to be replaced by motor-driven vehicles, road builders noted a difference in the effect of traffic upon the highways. It was evident from the first that surfaces of all types were wearing out more rapidly and that they were deteriorating in a different way.

And for a surprisingly long time that was about all that was known of the effects of the new kind of traffic. Various theories were put forward, some rather crude tests were made and noteworthy progress was made in developing new types of pavements to withstand the new traffic. But the actual knowledge of the destructive effects of this traffic could very nearly be summed up by the statement that they were greater and different. How much greater per unit of load carried or in just what ways they differed remained undetermined.

Though it may seem strange that such condition persisted for so long, little blame should attach to road officials and engineers. With the coming of the new traffic and the rapid increase in its volume and in the weight and speed of vehicles there came an insistent demand for more and better roads. This demand had to be met, and the money, the time and the facilities of state, county, town and city highway authorities were no more than adequate to that end. The taxpayers chose their road officials to build roads; the money supplied from the public funds was appropriated for the construction of roads, the roads it was to be used for often being specifically designated; and because highway departments were generally under-manned, the time of the engineers was entirely taken up in construction and maintenance work. Had road building been a private enterprise conducted for profit, the need for experimentation and research probably would have been recognized and provided for, but being public work the necessity was not pressed upon those who would have had to supply the funds for carrying it on, especially since really worth while research would be costly and would require a long time.

The results so far announced by the Bureau of Public Roads are important, but they constitute only a beginning. As is announced in the closing paragraph of the article to which reference has been made, further investigations will be made for the purpose of determining, both qualitatively and quantitatively, the effects of different kinds of tires, of varying speeds, of amount of load, of spring characteristics and other factors in the impact of truck wheels upon road surfaces. These may be expected to yield data of great value to road builders, for only in such measure as the designing of roads and the selection of surfaces approaches an exact science can the art of road building be developed as it should. The work being done by the Bureau of Public Roads, and any similar work undertaken by other organizations, will be watched by road builders with a great deal of interest.

To Supervise Indiana Road Accounts

State Board of Control May Exercise Its Authority to Supervise Awarding of Contracts by Highway Commission

The State Board of Accounts may exercise supervision over all contract lettings and the handling of large state and federal funds by the Indiana State Highway Commission, according to recent reports.

The State Board of Accounts has direct authority to go into the commission's offices at any time and examine all records, despite the fact that there is no law directly authorizing the board to require the submission of its plans by the highway commission before proceeding. Within the past few months more than twenty big road contracts, involving nearly $5,000,000, have been let through the State Highway Commission's office.

October Automobile Accidents in New York

Fatalities in State Number 104 Including 59 in Greater New York

During the month of October, 104 persons were killed by automobiles in the State of New York, according to statistics recently made public by the National Highway Protective Society. This total includes 59 fatalities in New York City. In the corresponding month of 1918, the total number killed in the state, including 56 in the city, was 95.

Besides the persons killed by automobiles in the streets of New York City, 5 were killed by street cars and 7 by wagons during last month. In October, 1918, fatal accidents in the city's streets included 17 caused by street cars and 3 by wagons, in addition to the 56 by automobiles.

New Jersey accidents in October, 1919, included 17 deaths by automobiles, 2 by street cars and 1 by a wagon. Grade crossing accidents were responsible for the deaths of 6 occupants of automobiles in New York State and 4 in New Jersey.

Impact of Truck Upon Road Surfaces

(Continued From Page 204.)

within the time of one vibration of the spring, the magnitude of the impact at the landing point will depend upon whether "d" is less than "e," equal to "e" or greater than "e." If the period of vibration is such that the spring has acquired its maximum acceleration, and at this instant also lands at the point of impact on the road surface, the impact value will be a maximum. The impact value will be a minimum when conditions are such that the spring is returning to its closed position and is at the point of maximum acceleration in this direction as the impact occurs. This explains why the impact values, as shown in the curves, do not consistently increase with the height of the drop. The static loads equivalent to the impact values under the higher loads and drops are as much as five times larger than the total dead load.

Power Increases Impact

It was noticed during these tests that the impact was appreciably affected by the conditions of power on or off. That is, if the impact occurred when coasting it was less than when the power was being applied to the rear wheels. This difference amounted in some cases to as much as 30%.

These results are presented at this time for the purpose of showing the general tendency of impact values. It is the intention to enlarge upon this investigation to determine the relative effects of kinds of tires, loads, speeds, spring characteristics, and character of road obstructions and defects which produce impact values, and attempt to arrive at some definite conclusions as to the destructive effect of truck loads on different types of roads. It is hoped that this will ultimately result in definite road design data, and also lead to the establishment of rules and laws for the allowable loads and speeds of auto trucks, and possibly furnish an equitable basis for license fees. Special apparatus is being designed to obtain autographic records of these tests.

DeKalb County, Georgia, has voted a road bond issue of $750,000, by an overwhelming majority. The election was the second held on the question.

On a Short Concrete Road on a Massachusetts Project the estimated cost is at the rate of $127,864 per mile. This is the highest average cost per mile so far shown in a federal aid road.

Wisconsin Counties have recently voted bonds as follows: Rock County, $1,500,00; Jefferson County, $2,000,000; Washington County, $2,000,000; Wood County, $1,500,000 and Racine County, $2,350,000.

According to the Superintendent of Streets of Hartford, Conn., no difficulty has been experienced in procuring oil for the roads this year. The average number of gallons used each year is about 450,000, but during 1918 but 189,000 gal. were used. From Jan. 1, 1919, to date the department has used about 300,000 gal. and it is estimated about 100,000 gal. more will be necessary, the heavy rains making is imperative that more oil be used. Out of the total macadam mileage of 107 mi., the department provides for oiling 93 mi. each year.

Commissioner Greene, of the New York State Highway Department, has ordered all advertising and political signs on the public roads to be torn down. Only signs which point direction or distance or which designate some danger will be allowed to remain. There is a state law prohibiting advertising signs within the limits of a highway and while this law has never been rigidly enforced, in answer to complaints made regarding the above order, it was said that if the department was determined to enforce the law nothing could be done.

The State Highway Commission of Oregon will press road construction in that state through the winter despite the rainy season which has previously caused the discontinuance of work. Paving, however, will soon be discontinued, but rock work will be carried on and there are many miles of road under contract for macadamizing. During August the contractors performed $1,200,000 worth of work and in September their estimates were for $1,400,000. September was the heaviest month for road building since the state undertook the development program and would have been even heavier had not the contractors been held back on account of shortage of rock and other materials. The rock shortage has been one of the principal causes why a greater amount of road work has not been accomplished.

HIGHWAY TRANSPORTATION

Demonstration Truck Tour

Trip Through Agriultural States Made by 18 Trucks and 80 Men to Demonstrate Value for Hauling and Other Farm Work

An unusual demonstration of the utility of the motor truck to farmers was made recently by a 3,000-mi. truck tour through the states of Illinois, Iowa, North Dakota, South Dakota, Minnesota and Wisconsin. The trip was made under the auspices of the National Association of Motor Sales Managers, which will hold a convention at the Hotel Statler, Detroit, Mich., on Friday and Saturday of this week to discuss the results of the tour.

The prime object of the tour was to prove to farmers that the motor truck can be used to advantage on bad roads as well as good ones and in soft fields. At the many stops, lectures on farm motorization were given by A. R. Krohop of the Goodyear Tire & Rubber Company's truck tire sales department. Moving pictures were also shown and band concerts were given by a naval band of 25 pieces from the United States Naval Training Station at Chicago, which traveled with the train. Various demonstrations of the varied uses of the truck were given. They were used to operate threshers, corn shellers, ensilage cutters and other farm machinery and in one instance four of the trucks cleared a 35-acre wheat field in three hours, hauling the grain 1½ mi. to the thresher.

About 10,000 ft. of motion picture film was taken during the tour. The film is to be used by the Pan-American Union in its commercial campaigns in South America and is also to be exhibited before many agricultural societies in this country.

The machines making the trip, their capacities, and the kinds of bodies were as follows:

Atlas, 1 ton, Parry convertible body; Atterbury, 2 tons, rack side body; Bethlehem, 1½ tons, wire screen express body; Clydesdale, 1½ tons, "eight in one" farm body; Diamond T, 1½ tons, farm special body; Gramm-Bernstein, 2 tons, "five in one" body with hand hoist; Master, 1½ tons, semi stake body; Maxwell, 1½ tons, stake body; Republic, 2½ tons, special farm body; Service, 1½ tons, special farm body; Selden, 1½ tons, "five in one" farm body; Signal, 1 ton, "six in one" farm body; Sterling, 2½ tons, flare board express body; Winther, 1½ tons, 4-wheel drive, express body; Hawkeye, 2 tons, semi stake body; Sterling, 2½ tons, as Goodyear service car; Master, 1½ tons, service car; Diamond T, 1½ tons, as Standard Oil service car.

The trucks, which were all equipped with pneumatic tires, were in charge of M. D. Scott, a transportation expert of the Goodyear Company. Maj. E. M. Lubeck and Capt. H. C. Mitchell of the War Department also accompanied the trucks to note the performance of the pneumatic tire equipment.

The officers of the National Association of Motor Sales Managers are as follows: President, J. E. Tracy (Sterling); First Vice President, H. T. Bouldon (Selden); Second Vice President, W. D. Rightmire (Winther); Secretary, E. T. Herbig (Service); Treasurer, A. R. Fernald (Willys Commercial); Executive Secretary, J. M. Carney (Sterling).

The Kind of Road that Increases Living Costs

A Road that Makes for Lower Costs and Progress

EXTREMES IN ROAD TYPES ENCOUNTERED ON MOTOR TRUCK DEMONSTRATION TRIP

Special Packard Truck Makes Speedy Long-Distance Run

Packard Motor Car Company officials in a pneumatic tired Packard truck of a new model recently established what is regarded as a road motor truck speed record. The run between Bay City and Detroit, 120.6 mi., was made in 5 hours and 52 minutes, or at the rate of 20.6 mi. an hour.

The trip was an experiment made by the officials to acquaint themselves with actual freight transportation problems. The truck carried 18 passengers with their baggage and two 1,000-lb. weights—practically its capacity load of 3 tons. Practically one-half of the distance traveled was over roads that had been wet by recent rains.

The truck was especially designed and constructed to meet the growing demand for pneumatic-tired freight carriers and was equipped with Goodyear cord tires, 38x7 in front and 40x10 on the rear wheels. The body was a 12x6 ft., of the 36-in. stake type.

Blot Out the "Bolshevik Roads"

Bad Roads Retard Progress, Keep Down Realty Values, and Increase the Cost of Living — Prosperity and Decreased Costs Depend Upon Their Improvement

By G. A. KISSELL*

Have you "Bolshevik roads" in your locality, in your county, in your state? If so, blot them out before they have so undermined the prosperity of your municipality that municipal growth is stunted and dies and prosperity moves elsewhere.

The "Bolshevik road" is the road full of holes, ruts, stones or mud: that makes progress an expensive trip for either automobile or motor truck. The "Bolshevik road" keeps visitors, tourists and "new blood" from entering your town, thereby retarding the growth of your city, discouraging new enterprises and investments and keeping realty values down.

The "Bolshevik road" is one that gives outisders the wrong impression of your city, a suspicion you are behind the times. They cannot help thinking that all pride in your city has vanished—that you are not progressive or up to date.

We, as Americans, will not stand for the Bolshevik. Why? Because his policy is to destroy property and kill progress.

We will not stand for Bolshevik methods in our industrial plants and commercial institutions, because we know that such methods retard progress and eliminate efficiency.

We will not stand for Bolshevism in our schools and churches to be taught to young America, because we know that such a creed would undermine character and create a form of government similar to that now marked by crime and murder in Europe.

We all know that orderliness, law and system are the three great pillars of the foundation of any municipality, causing us to build attractive homes, office buildings, public institutions, asphalt and macadamized roads, beautiful parks—all because it is a part of the national policy of Americanism.

Yet, why do we shut our eyes to the existence of the many hundreds and thousands of "Bolshevik roads"—roads that are no more fit to travel over than the marshlands or quicksands? Yet we expect our automobiles and motor trucks to transport heavy loads over such roads and not have to pay for it in the end.

Every consumer in your city or town buying a dozen eggs or a loaf of bread, a suit of clothes, a pair of shoes, or a piece of furniture, has to pay for transporting goods over such roads. Transportation cost is a part of the cost of every article before it is sold. It is as necessary a part of the cost as making that article or the material that goes into it.

Therefore, the more it costs to get that article into your city, the more will have to be added to the purchase price you pay.

Again, have you ever noticed the usual condition of property situated on poor roads—the farm buildings in a run-down condition, unkempt and untidy? Compare this condition with the property past which improved roads run. Usually you have the opposite—the buildings are kept up, the fences are in the best of condition, there seems to be a municipal pride, which is nothing more or less than a reflection of the good roads. Investors seem to realize that when they are paying for improved roads, the property past which the good roads run is likewise improved; and the natural result is an increase in realty values. Good roads invite travel as well as increase it. It has been found that in those municipalities that have been noted for their road improvement, traffic has increased anywhere from 25 to 50 per cent. and part of this increase is composed of vehicles that formerly traversed other routes through other communities, but which naturally abandoned them when the new roads offered a saving not only in time and labor, but in operating upkeep.

Consider just what this cost means to the other communities. Formerly these vehicles stopped at garages in other towns—the drivers put up at other hotels—they purchased supplies at other stores—necessities were purchased in the community in which they were stopping. All of which brought increased trade to the merchants of that community.

When these vehicles were attracted elsewhere by the new and improved roads, all this business went with them; consequently the merchants of that vicinity were paying a terrific price because they did not keep up with the march of progress and improve their roads.

Again, consider the community without good roads: It costs more to transport goods and supplies over these roads, necessitating the merchant's increasing the price of commoditie to the consumer. The housewife has to pay because it costs more to transport the goods over the poor roads.

The consumer in the city which has good roads buys the same goods at a lower price because it did not cost as much to haul and deliver them as it would if the vehicles had to use unimproved roads.

Again we come to the worst months of the year—we are on the threshold of winter, in which every destructive and destroying element is let loose. The necessity for good roads has been preached the year round. Moving pictures, catalogs, every conceivable form of publicity has been used to call attention to the advantages of good roads over poor ones. That this publicity has done a great deal of good is evident from the immense amount of construction work that has been going on and is now going on in all parts of the country. Communities that formerly were isolated from the outside world and had to depend on the uncertain schedules of short-line railroads, are now in direct communication with distributing points, but there are still hundreds and thousands of communities that have not "seen the handwritng on the wall," and as a result are up against transportation problems upon the solution of which depends the progress of municipal growth.

In many parts of the country good roads bond issues have been voted at local elections, excellent indications that the people of those communities have had their eyes opened to the danger to their municipal growth.

But those communities that are still wallowing in the mires of "Bolhsevik roads" will sooner or later have to pull themselves out of the mud if they would keep up the pace set by their sister communities.

———ooo———

Grashoppers and Chickens seriously delayed the construction of concrete road in Mercer County, Pennsylvania, according to a recent report. The work in question was on a road through a farming section which was infested with an unusual number of grasshoppers. The insects disturbed in the fields settled on the soft concrete and were followed by chickens from a farm near by, with the result that the soft surface of the pavement was ruined.

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*President, Kissel Motor Car Co.

Who's Who for Good Roads

Men Prominently Indentified with Highway Development

From time to time we print on this page biographical sketches of the men who build the country's roads and the men who develop highway transportation —men who as a class are playing a most important part in the making of the nation. It is our hope that these brief sketches and the portraits will serve to bring closer together the earnest workers all over the country who are devoting their lives to this great work.

W. P. MOORE

C. B. SCOTT

M. O. ELDRIDGE

A. H. BLANCHARD

W. P. Moore

Chief Engineer Tennessee Department of Highways

W. P. Moore, Chief Engineer of the Department of Highways of Tennessee, was born Nov. 16, 1870, at Columbia, Tenn., where he is still a resident.

Mr. Moore has been making a specialty of highway construction for the past fifteen years, having been chief engineer and consulting engineer on work over the entire South. He was president of the Alabama Association of Highway Engineers in 1914 and was recently appointed to the position which he now holds.

Among the highways constructed under his supervision, are roads at Jackson, Tenn., Meridian, Vicksburg and Macon, Miss., Palm Beach and St. Lucy County, Fla., and the cantonment roads for the Government at Chicakamauga Park, near Chattanooga.

C. B. Scott

Assistant Commissioner, Virginia State Highway Commissiom

C. B. Scott, Assistant State Highway Commissioner of Virginia, was born at Raleigh, N. C., June 28, 1875. He received his education in the public schools and academies of his native state.

Mr. Scott's first engineering work was as chainman, rodman and instrumentman on various engineering parties. He then followed farming for two years and in 1896 returned to railroad work as a track hand on maintenance of way. Two years later he became a track foreman, and a year later was made an instrumentman on the Richmond, Petersburg & Carolina Ry. From this time until 1903 he worked as instrumentman, assistant engineer, locating engineer and resident engineer on the Chesapeake & Ohio, West Virginia Central & Pittsburgh and West Side Belt R. R. of Pittsburgh. After a rest enforced by ill health, he became engineer for the Beacon Coal & Coke Co., in August, 1904. He left that position in April of the following year and became resident engineer of the Chesapeake & Ohio Ry.

In July, 1907, he became a resident engineer with the Virginia State Highway Commission, with which he has been connected since that time. He was made an assistant engineer in 1908, and assistant state highway commissioner in December, 1913.

M. O. Eldridge

Director of Roads of the American Automobile Association

M. O. Eldridge was born in Loudon County, Tennessee, in 1874 and was educated in the public schools of that county and at the University of Tennessee. After about a year of teaching he was appointed a draftsman in the Office of Public Road Inquiry (now the Bureau of Public Roads) and remained with that bureau until he resigned recently.

Between 1895 and 1899, Mr. Eldridge had charge of object lesson and experimental road work, and during the next five years served as assistant director of the Bureau. He was then given charge of statistical, extension and propaganda work, serving in various positions.

Mr. Eldridge is the author of many of the Bureau's publications and also of many other articles on roads and road work. In his new position with the American Automobile Association he will act as secretary of the Good Roads Board and as assistant editor of the "American Motorist."

Arthur H. Blanchard

Professor of Highway Engineering, University of Michigan

Prof. Arthur H. Blanchard, whose appointment as professor of highway engineering at the University of Michigan was noted in a previous issue, was born Feb. 10, 1877, at Providence, R. I. He was educated at Brown and Columbia Universities, receiving the degree of C. E. from the former in 1899 and the degree of A. M. from the latter in 1902.

From 1896 to 1903 Prof. Blanchard was employed in the highway engineering department of the City of Providence, R. I., and by the American Bridge Co. In 1903 he was made deputy engineer of the Rhode Island State Department of Public Roads and served in that capacity until 1911. In that year he was appointed professor of highway engineering at Columbia University and established the graduate course in highway engineering, which was continued at Columbia until 1917. During the period from 1899 to 1911 Prof. Blanchard also served as a member of the faculty of civil engineering at Brown University.

During his professional career he has served as consulting engineer to various cities and counties and to various public bodies, including the United States Bureau of Public Roads, the State Highway Commissions of New York and Pennsylvania, the New York State Department of Efficiency and Economy and the Board of Water Supply of the City of New York.

Prof. Blanchard has made two trips abroad to study highway work in Great Britain and on the Continent. He served as United States reporter at the Second International Road Congress in Brussels in 1910 and at the Third International Road Congress in London in 1913.

Prof. Blanchard is the author of a number of standard books on highway engineering including, "Elements of Highway Engineering," the section on highway engineering in the "American Civil Engineers' Pocket Book" and several sections of the "American Highway Engineers' Hand Book." He was also editor-in-chief of the last named. With Henry B. Drowne he wrote "Highway Engineering as presented at the Second International Road Congress, Brussels, 1910" and "Text Book on Highway Engineering."

He was president of the American Road Builders' Association last year, and is now president of the National Highway Traffic Association. He is a member of many other engineering and road organization including the American Society of Civil Engineers, the American Society for Testing Materials, the American Society of Municipal Improvements and the American Chemical Society. The foreign organizations of which he is a member include the Engineering Institute of Canada, Societe des Ingenieurs Civils de France, Association Internationale Permanente des Congres de la Route, Association Internationale pour l'Essai de Materiaux and the Roads Improvement Association of Great Britain.

He has taken an active part in the study of testing methods, serving as chairman of Committee D-4 of the American Society for Testing Materials and the committees on Standard Tests for Bituminous Materials and on Broken Stone and Gravel Roads of the American Society of Municipal Improvements.

PUBLICATIONS

PORTLAND, ME., COMMISSIONER OF PUBLIC WORKS. Annual report for the year 1918. Paper, 6x9 in., 76 pages and covers; illustrated.

This report consists chiefly of statistical matter on the details of the operations of the Department of Public Works.

ST. LOUIS, MO. CITY PLAN COMMISSION. "The Zone Plan." Paper, 6½x10 in.; 82 pages and covers; illustrated; inset maps.

This publication contains a detailed report on the St. Louis zone plan, which is intended by the City Plan Commission as a final summary of the work done in preparing the zoning ordinance. It is illustrated by a number of views, mostly of streets in the city and contains three large inset maps.

AMERICAN HIGHWAYS. VOL. 1. By Victoria Faber Stevenson. Reprints from "Sinclair's Magazine." Board, 7x10½ in.; 55 pages; illustrated.

This book contains a series of popular articles on roads and road work, reprinted from "Sinclair's Magazine," with an introductory chapter consisting of a condensation of two preliminary articles by the editor of that publication. The contents include articles on the Lincoln Highway, the Dixie Highway, the Yellowstone Trail, the National Old Trails Road, on road building with convict labor, on motor truck transportation and other subjects. It is printed in brown on buff paper and is profusely illustrated.

MEETINGS

Calendar of Coming Meetings

Nov. 11-14—American Society for Municipal Improvements—Annual convention, New Orleans, La. Secretary Charles Carroll Brown, Valpariso, Ind.

Dec. 8-11.—American Association of State Highway Officials.—Annual meeting, Louisville, Ky. Chairman, Geo. P. Coleman, State Highway Commissioner of Virginia, Richmond, Va.

Jan. 15-16, 1920—Southern Appalachian Good Roads Association—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Feb. 9-13, 1920—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Apr. 12-17, 1920—United States Good Roads Association.—Eighth Anual Convention, Hot Springs, Ark. Director General J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Apr. 16-17, 1920—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

National Grange

Participation in highway work by the Federal Government will be one of the subjects of discussion at the annual meeting of the National Grange at Grand Rapids, Mich., Nov. 12 to 21.

Not long ago the Washington representatives of the Grange sent to every state official of the organization a letter in which was enclosed a communication from Senator Townsend explaining the bill which bears his name and setting forth the arguments for its adoption. The replies received, it is stated, were about 12 to 1 for the passage of the measure.

At the coming meeting the committee on highways will present its report and it is expected that the orginization will take action.

PERSONAL MENTION

R. C. Sykes has resigned as general manager of the Troy Wagon Works Co., of Troy, Ohio.

R. V. Glenn, formerly government engineer in Texas and Louisiana, has been appointed consulting engineer in Tarrant County, Texas.

Julius Adler has resigned as engineer of tests of the Pennsylvania State Highway Department to become technical engineer in the asphalt department of The Atlantic Refining Co. Mr. Adler has been with the Pennsylvania State Highway Department since 1916. He was assistant engineer in the Bureau of Highways of the City of Philadelphia from 1912 to 1916, and previous to that time had been with the City of Seattle, Wash., and the U. S. Office of Public Roads. He had also been an instructor in civil engineering subjects at the University of Pennsylvania and the State University of Washington.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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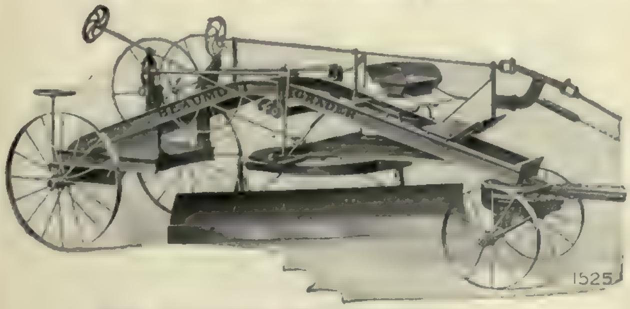
Beaumont Road Building Machinery
THE BEAUMONT GRADER
The Only All Steel Roller Bearing Road Machine



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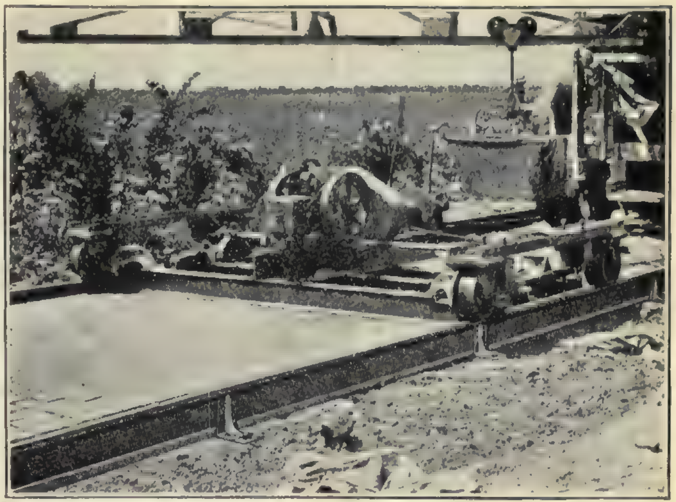

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MIXER LOADER

Cuts out all wheelers—make a worthwhile labor-saving—speeds up the operation of the mixer

THE Koehring Mixer Loader precedes mixer under its own power. Materials are shoveled into bins on the frame, movable along frame Measures sand and stone by striking off. Bins are adjustable for any proportion of "mix", any capacity of mixer. Materials fed through bottom gate of bins to belt conveyor that carries materials to mixer at speed of 500 feet per minute. Write for catalog.

Koehring Machine Co.
Milwaukee, Wis.

Galveston's oyster-shell streets successfully surfaced with Tarvia

WE have repeatedly claimed that there is a grade of Tarvia and a method of application that will solve practically any road problem—and solve it economically.

Now comes a letter from George H. Willits, City Engineer of Galveston, Texas, telling how Tarvia improved that city's oyster-shell streets, and at the same time reduced maintenance expense. A portion of Mr. Willits' letter follows:

"Practically *all* of Galveston's streets, outside of the business district, are built of rotted oyster shell, commonly called mudshell. This shell is easily compacted into a smooth, hard road surface which looks very much like concrete. However, this surface will not withstand wet weather nor the abrasion of heavy traffic, becoming very dusty in summer and on account of its white color, causing a disagreeable glare, and in the rainy season soon becoming muddy and full of holes.

"In May, 1917, we began surface treating these shell streets with "Tarvia-B" and "A" and trap rock and have had very fine results from this work. Our streets stay in good surface during all kinds of weather; we have eliminated heavy maintenance bills for shell and do not find it necessary to sprinkle these treated streets as we are compelled to do all untreated shell streets for eight months in the year. The dark color of the Tarvia surface entirely eliminates the disagreeable glare.

"The people of Galveston are very much pleased with the results obtained by surfacing the streets with Tarvia and testify to this by always seeking the treated streets for the heaviest travel."

We believe we may safely say that no matter *what* kind of a road problem you are facing, Tarvia will help you in the solution—and save you money, too.

Three views of the oyster-shell roads in Galveston Texas, surface-treated in 1917 with "Tarvia-B and "A." At top are shown 35th Street and Broadway. Lower view shows 20th Street, in the business section of the city.

Illustrated booklet free on request.

Special Service Department

This company has a corps of trained engineers and chemists who have given years of study to modern road problems. The advice of these men may be had for the asking by any one interested. If you will write to the nearest office regarding road problems and conditions in your vicinity, the matter will be given prompt attention.

Tarvia

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GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE
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The Construction and Maintenance of Gravel Roads*

By FREDERICK H. COLBURN†

In selecting the type of surfacing material to be used on any section of road the engineer must base his analysis on that type which will satisfactorily carry the traffic imposed upon it for the least annual cost. This annual cost must take into consideration: First cost, interest on money invested and maintenance.

The procedure in this analysis should start with the lower class surface and continue until a surface is found which will answer all requirements. As "gravel roads" is the subject of this paper, let us pass over the earth road and consider the gravel. The following items should be used as the basis of conideration:

1st. Traffic (amount and nature).
2d. Quality and availability of materials.
3d. Increase in traffic due to improvement or development.
4th. Comparison of money necessary and that which can justifiably be expended in maintaining the road.

Traffic.—An investigation of the traffic should be made, taking into account the number and kind of vehicles. If any doubt exists as to the advisability of submiting a gravel surface to the traffic found, contiguous roads or other roads over which traffic conditions are similar should be studied as a criterion for guidance.

If the traffic is too light, the gravel road might be satisfactory but not economical. This, of course, is provided earth road could be constructed more cheaply. In some cases gravel might be as easily and as cheaply used as earth.

If the traffic is too heavy, a gravel road would be neither satisfactory nor economical. In this case gravel should not be considered. The question naturally arises: How much traffic will the gravel road withstand? This depends largely on the quality of material used. A summation of the ideas of different authorities on this subject would tend to show that a properly constructed gravel road may be expected to carry from 300 to 550 vehicles per day. With an exceptionally good gravel this maximum limit might safely be increased.

This brings us to the second item in our analysis.

Quality and Availability of Material.—There is a great variance of opinion as to what constitutes good road gravel. Gravel occurs in such a multiplicity of forms and compositions that it seems to me impossible that any set rule can ever be made which will serve as an unalterable specification for its use in road construction. There are, however, certain facts which can be determined by observation and tests

A NEW HAMPSHIRE STATE ROAD NEAR KEENE

GRAVEL ROAD AROUND NEWPOUND LAKE, N. H.

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*Paper presented at the quarterly meeting of the New Hampshire Good Roads Association, Berlin, N. H., September 11, 1919.

†Assistant State Engineer, New Hampshire State Highway Department.

which are invaluable in the final selection and manipulation of the different materials of which the finished aggregate is composed.

The same essentials that are required in all good road materials are necessary in gravel, namely: Hardness (resistance to wear) and cementing or binding power. The hardnes of the stone composing the gravel depends wholly on the bed-rock adjacent to the deposit. The glacial drift in its southeasterly movements ground off the surface of the bed-rock and carried it varying distances, finally depositing it in what we are now pleased to call gravel banks. As this bed-rock was composed of hard or soft stone, just so is our gravel deposit influenced. The hardness can easily be determined by the abrasion test. Although I have been unable to find any specification which stipulates the per cent. of wear allowable, the consensus of opinion would tend to show that gravel stones having a wear of 10% and less are good; 10% to 15% fair; over 15% rejected. This test gives the hardness of the stone in the aggregate; next we must determine the quantity of stone. The value of gravel as a road material is in almost direct proportion to the per cent. of stone constituting the mass. The quantity can easily be determined by screening a weighed sample through a ¼-in. screen. No specification allows less than 60% of stone by weight.

A TYPICAL NEW HAMPSHIRE GRAVEL ROAD UNDER CONSTRUCTION

If the quality and quantity of stone meet requirements, the question now arises: How are the stones to be bonded together? What is the binder?

The determination of this factor is of paramount importance and should be given much consideration by the engineer. Too much stress is often placed on the immediate packing qualities. Immediate packing quality often means poor wearing quality. Some gravel road builders have become so imbued with the idea that it is necessary to use a gravel that will pack quickly, that they have almost lost sight of the fact that the only thing that makes a gravel road better than an earth road is the real stone that it contains and that is depended upon to bear up traffic and resist wear.

The binding quality may be due to the shape and varying sizes of the pebbles composing the gravel and in part to the presence of clay, till, lime or oxide of iron. Clay and till are the principal binders found in our gravels. Clay or till may be found mixed with the gravel stones; it may be rock flour produced by the grinding up of the stones in the aggregate or it may be incorporated by a careful manipulation. Some till has no binding quality whatsoever. Some will bind in wet weather but in dry weather lose all its cementing value. Too much clay is detrimental. It should never be present much in excess of 10% of the mass. It is not necessarily a cause for immediate rejection because the gravel in its natural state is not up to requirements. A gravel bank is often uncovered which may contain too much binding material and if put on the road would produce mud in wet weather. Possibly, by careful search, a sandy gravel may be found within easy hauling distance, and a proper combination of the output of the two pits will result in a good road.

Regarding availability of material, the two factors to consider are length of haul and accessability of pit.

The increase in traffic due to improvement or development should not be figured too far in the future. The argument of increased traffic is too often used as a basis for rejection of gravel. Do not lose sight of the fact that a properly constructed gravel road is to have the same care given the essentials of road construction, drainage, alignment and grade as a more expensive class. Also, that this gravel surface, pounded down under traffic, makes an ideal foundation course for another surface. Consideration should be given gravel for the length of time it will answer the purpose and for its value as a foundation course.

NEW HAMPSHIRE GRAVEL ROAD; BUILT IN 1908. PHOTOGRAPHED 1918

Comparison of Money Necessary and that which can Justifiably be Expended in Maintaining the Road.—Let us assume an example: We have been called upon to construct a certain section of modern country road. There is apparently a division of opinion among the inhabitants of the district through which this road is to run. Some favor a high-class type of pavement while others, possibly thinking of the effect of the hard pavement upon horse-drawn traffic, favor a gravel road. Gravel is plentiful, and material for the high-class pavement is also within easy hauling distance. How is the work to be financed? We will assume a customary procedure in such matters. The authorities, on account of the large expenditure necessary to complete the road, have decided on the issuance of 20-year bonds at 4½%. As a conservative estimate, we will assume that the high-class pavement is to cost us at the rate of $20,000 per mile.

The annual charges for interest on and redemption of the bonds will amount to about $1,600. This is our minimum cost per mile per year for our improved road. This is assuming our road will not require one penny for maintenance. This is a condition devoutly to be wished for, but as yet not realized.

How much is the original cost of our gravel road to be?

The average cost of a gravel road should not be over $7,000 per mile. The annual charges for interest on and redemption of bonds in this case would amount to approximately $600. Theoretically, therefore, it would be economical to spend nearly $1,000 per mi. per year for gravel maintenance.

We know that this annual average amount is more than we need for the maintenance of gravel roads; $400 per mile per year would be a good average. This saving could be used for a sinking fund to be used in the construction of a higher type pavement on top of the gravel when conditions demand, or for the redemption of bonds. Therefore, this saving would increase the difference in cost, which our first figures show, in favor of the gravel road.

Providing that the engineer decides that gravel construction will meet requirements and that the quality of available gravel is satisfactory, he must next make provisions for the proper construction of the road.

The idea is prevalent that gravel road construction means carting and dumping gravel, knocking the top off the pile, and the road is finished. If you are using a type of surface which is saving you money over some higher type, why abuse it? Gravel construction should receive the same care as the highest type. Good drainage, foundations, etc. are essential. Why demand crushed stones be dumped on boards and then shoveled, when you dump gravel directly on the road? Do not allow a foreman to convince you that he can make just as good gravel road without using the dumping board. The liability is continuous and if humps appear in a year or so you must stand the blame. If a certain thickness of finished surface is specified, see that the specification is carried out. Too great depth of gravel put on in one course will not give good results. Two-course work is much more satisfactory and three-course work is advisable in some instances.

After the construction is completed continuous maintenance starts. It is unnecessary to tell a New Hampshire road builder the advantages of the patrol system for gravel roads. Results have proven that there is no method of maintenance which will equal it.

In speaking of the future of gravel roads it seems that their economic value is a recognized fact and, regardless of some prejudice, their construction will still continue to comprise a large percentage of the total new construction in this country. Gravel roads constitute about one-third of the total mileage of surfaced roads in the United States. Therefore, they have a reputation that competition or excessive traffic demands will not easily destroy.

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Presidential Address at Annual Meeting of the American Road Builders' Association

By GEO. P. COLEMAN*

Highway problems today are very much to the fore, and I believe that their solution will have great bearing on the stabilization of the country's interests.

In thinking over the crisis through which the country is passing, it has been impressed upon me that we, as an association, can do much for the interests which we represent, and at the same time advance the development of the country at large. This Association is particularly well suited to carry forward a movement which will be of assistance to the Government in its attempt to guide us safely through this reconstruction period, really the greatest revolution the world has ever seen, for the organization represents all highway interests—engineering, contracting, manufacturing, supplying, etc. —reaching from the interests of the humblest home to those of the multi-millionaire. From a more or less incomplete survey of the situation, you will find that all of the states are attempting extensive construction programs. From a rough compilation of these programs you will find that the country is in a position to expend for highway construction during the next twelve months approximately $750,000,000. This does not take into account some maintenance and other work which, under ordinary conditions, is carried on by the counties, townships or districts.

We are, therefore, confronted by the problem of carrying forward the construction program under the peculiar conditions which obtain in the country at the present time. It is our work then to try, insofar as possible, to overcome these difficulties, the chief of which are unsettled labor conditions and transportation of materials.

The first of these—unsettled labor—is due largely to the unrest in and the unwillingness of labor to function properly under these new conditions. I do not believe that there is such a serious shortage of labor, for, from a general survey of the situation in my state, I have found that on the whole there is ample labor to carry on prospective work, but that there is a decided unwillingness on the part of labor to return to pre-war conditions, and in this I believe the majority of us agree with them. It would be a waste of time and slowing up of development for the highway departments to consider at this time waiting for a reduction in the wage scale. There are too many intricate problems connected with this for us to anticipate any material change in this scale for years to come, but it is true that in many instances labor is not willing to consider new wage scales which are in any way within the bounds of reason, or, I might say, within the bounds of economical expenditure. This I think is due largely to a lack of understanding on the part of labor, brought about in a large measure by misrepresentations and misstatements by labor agitators. This has been made particularly easy in this period following the war activities, when those in authority had in mind the winning of the war, and evidently believed that it was necessary to meet every demand for increases, whether fair or unfair.

The condition which we must meet then is to make it possible for labor and the interest which we represent, as well as other interests, to get together to meet on common ground and work out a solution of the problems which mean the future welfare of the country. I am not attempting to give a solution or going further than to suggest that, since the interests in our Association are large users of labor, we, as an association, should give to this, not only our best thought and effort, but our immediate attention. I think that if you will go over this situation, you will note that the highway interests of the country have not been represented on the national industrial commissions and committees on reconstruction. I am fully of the opinion that we should have representation on these commissions, since the highway interests come closer to the people than any other industry. We were very quick to start on our highway construction program immediately after the armistice, some sections much more quickly than others, but those of us who are in close touch with the situation know full well that the people are not going to be satisfied with present progress and their demands are going to be so insistent—nay, imperative—that we will of necessity have to find a way to satisfy these demands.

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*State Highway Commissioner of Virginia, elected President of the American Road Builders' Association at the annual meeting on Nov. 7, 1919

Our second problem, is our old and vexatious friend, transportation. It is undoubtedly true that the amount of work which we can do within a year is wholly dependent on the amount of rail transportation which can be given to our interests. It is useless for me to tell you about the present transportation situation. All of us have been begging for cars and service for the past six months, but from the present outlook the situation seems hopeless.

I have made a number of trips to Washington for conferences with the Railroad Administration and others interested in transportation questions. I have found the Railroad Administration willing listeners, evidently anxious to assist us if possible, but it has always been evident in these conferences that we were well down on their preferred list, for the other big interests were making just as insistent demands, evidently with greater force. I think that in our dealings with the Railroad Administration we have failed in some way to make clear to them the importance of the work which we represent, that is, that the development of the country as a whole is dependent on highway construction; that highway construction is limited by railway transportation; that rural development is in a like manner dependent on highway transportation; that the producer, to give cheaper produce and in this way bring down the high cost of living about which we have heard so much recently, must have highway transportation; and that, really, the solution of the high cost of living is highway development.

I am sure that all of us agree that the present railroad situation is primarily due to inadequate motive power and a shortage of open-top cars, and that to get relief, the supply of cars and motive power must be largely increased, and that we must insist that the present supply of cars be used more efficiently. Many of us are undoubted offenders in this matter. The majority of the heads of the highway departments with whom I have discussed this matter are arranging to let the major portions of their work in the latter part of December, January and February, hoping that the contractors will be able in this way to distribute their transportation needs over a longer period of time. It has also been suggested that, since, from the report of the Car Service Section that there are annually about 200,000 open-top cars placed in storage in the winter months and early spring, if these cars could be used by the contractors during the winter months, it would materially relieve the situation. These materials would of necessity have to be stored in stock piles in the neighborhood of their work. This, at first blush, would apparently increase the cost of the work. I believe, however, that the contrary would be true, since the contractor would be able to hold his organization together during the winter months, and during the construction period would not suffer from the serious delays caused from non-delivery of materials.

I think it very generally agreed that the Government will return the railroads to their owners on the first of the year, either with restrictive legislation, or with the understanding that such legislation will be passed in the near future. Our part then, as I see it, is to see that the companies are provided with adequate funds to replace old rolling stock and motive power, and to buy such new equipment as will meet the present and future transportation demands.

The training of engineers should come in for our careful consideration. We are woefully behind in this. The colleges of the country should lay greater stress on highway engineering and turn out for us men better equipped technically to take charge of our construction and inspection work. The departments themselves should make a united effort to see that the salaries of engineers are made sufficiently attractive to obtain the best class of engineering assistance.

These are simply suggestions. The details would have to be worked out, but I believe that by uniting our efforts, not only of these in this Association, but of all of those interested in these questions, we can accomplish a great deal for highway development. To do this, however, we must present a united front. There are at the present time associations without number interested in highway questions. As a matter of fact, there are associations within associations dealing with each branch of highway work. There should undoubtedly be one large association, including every highway interest in the United States, not confining itself to any one state or any one section. This association should act for all highway interests in all public matters. It would undoubtedly be advisable for the various smaller associations to be affiliated with the central association, and act in unison with that association. Not until we do this, not until we become broad enough and big enough to forget our petty jealousies, are we going to place ourselves in a position to demand and to get the recognition that is due the interests which we represent.

What we need is a Moses to lead us out of the wilderness, a man who has sufficient red blood in his veins to stand up and fight the situation to a finish.

These are the problems which confront our association now. What are you going to do with them?

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The Mississippi Legislature will be asked at the January session to authorize a bond issue of $25,000,000 for roads, according to a recent report. The plan to be suggested provides for the creation of a sinking fund by means of a tax upon automobiles, based upon horse power. It is estimated that ten years will be required to retire the bonds.

Madison and Ballinger Counties, Missouri, have voted road bond issues of $325,000 and $350,000, respectively. The funds from the Madison County issue will be used, with $130,000 obtained from other sources, for the construction of 50 mi. of state highway extending from the St. Francois County line to Wayne County where it will connect with the state highway running southerly to Greenville, Piedmont and Williamsville. Ballinger County will use the funds from the sale of the bonds to build two state roads and a system of gravel roads connecting the eight townships of the county.

Carrying Out the Road Program of Tom Green County, Texas, is likely to be delayed by the present high cost of materials and the scarcity of labor, according to a recent report. The taxpayers in March last voted $500,000 in bonds for the purpose of improving the county's highways. The money has been received, but no definite action toward beginning the work has been taken. It is the hope of the commissioners that there will soon be a decline in the cost of materials and also that it will be possible to procure labor. Four large army trucks that were allotted to the county are being used for the hauling of materials for the road crews that are keeping the highways in passable condition.

Nassau County, New York, is to have a new state road about 15 mi. long and 18 ft. wide, 2 ft. wider than the ordinary state road, the extra cost to be borne by the towns. The expense to Nassau County will be about $200,000. The new road will run parallel with the Merrick Road, and will begin just east of the Hempstead branch of the Long Island Railroad at Valley Stream, then run easterly to the Hempstead road at Lynbrook, through a highway to Lakeview Ave., then on to Rockville Centre, where it will follow Seaman Ave. to Freeport and join the Hempstead and Babylon Turnpike, turning south to Smith St., east to Merrick and Bellmore and on to the end of the road at Massapequa and the Suffolk County line. It is expected that the road will divert much traffic from the Merrick Road and make it safer for travel.

GOOD ROADS

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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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THE PROBLEMS BEFORE ROAD BUILDERS

Those who are interested in the work of improving the country's roads will find much food for thought in the presidential address of Geo. P. Coleman, State Highway Commissioner of Virginia, before the American Road Builders' Association on the seventh of this month. It is printed in full on other pages of this issue.

In the opening paragraphs of the address, President Coleman called attention to the gigantic road building program of the country, saying that the country is in a position to expend approximately three quarters of a billion dollars for highway construction during the next twelve months, this figure taking no account of the sums to be expended for maintenance and other work carried on by counties, townships or road districts. Whether or not this estimate is exact, there is little doubt but that at least that sum will be expended if no unforseen contingencies prevent, and the figure gives some idea of the great importance of road building and, therefore, of the problems facing road builders.

The chief of these problems, as viewed by President Coleman, are the unsettled labor conditions and the difficulties of securing transportation.

The first of these, he believes, is due more to the laborer's unwillingness to work under "pre-war conditions" than to any real shortage of labor. He might have said, with a large measure of truth, the unwillingness of the laborers to work under any conditions. He is quite right, too, we believe, in assuming that no one expects labor to go back to the wage that prevailed previous to the war. All living csts have risen and it is only fair that the worker, be he skilled or unskilled, should be granted a proportionate increase in wages. The laborer should not be expected to accept a lower standard of living, but he should realize his obligation to perform a fair day's work for a fair day's pay. In too many instances he recognizes no such obligation but is taking advantage of the crisis through which the world is passing to enforce unreasonable demands.

Those in charge of road work, on the other hand, must take account of conditions as they are, not as they ought to be. President Coleman holds the belief—which is shared by many able economists—that it is useless to expect any material reduction in the scale of wages for years to come and he is doubtless right in his contention that it would be a waste of time and a slowing up of development for highway departments to consider waiting for a reduction instead of going ahead with road work. Good roads do cost more, in money, than they did before the war. But money is not the true measure of the cost of a road any more than it is the true measure of the cost of any commodity. Just at present money is cheap. Moreover, the cost of a road is only one of the things to be considered; its yield, or the return on the investment, must also be taken into account. And when that is done it will be seen that the relation between cost and return has not greatly changed.

As a way to a remedy of the labor situation, President Coleman suggests that the American Road Builders' Association, especially since its membership is made up of large users of labor, should give the matter not only its best thought, but should give it immediate attention. This, we believe, is true. As pointed out by President Coleman, the members of the A. R. B. A. are employers of labor on a large scale and on work of the utmost importance to the industrial and commercial progress of the nation. As individuals, its members have a broad and deep understanding of labor conditions and a large proportion of them are men of influence, often more than local. By getting together they should be able to accomplish at least their share in the solving of the great problem of labor that must be solved if the nation is to continue its progress.

The second problem referred to by President Coleman is a particularly difficult one, for it really includes two distinct problems both of which are complex in the extreme.

The first is that of impressing upon those in authority the great importance of highway work and of the need of their doing everything possible to facilitate its progress. President Coleman's conclusion that the efforts made by road builders to convince the Railroad Administration of the importance of road work has not met the success they deserve doubtless expresses the opinion of many other road officials and engineers. Just why this should be so is not readily apparent, but the fact seems obvious.

The second involves the whole big question of the railroads with all of its ramifications, economic and political. The difficulties in the way of shipping road materials are due primarily to inadequate motive power and a shortage of open-top cars, according to President Coleman. Why such lack of facilities should continue to exist is not within the scope of this discussion, but it is pertinent to direct especial attention to President Coleman's suggestion for a remedy.

This remedy is the shipping of road materials during the winter months. He points out that, according to a report of the Car Service Section, some 200,000 open-top cars are placed in storage during the winter and early spring and that if these could be used for the hauling of road materials during that period the situation would be relieved. This would necessitate planning road work well in advance and the awarding of contracts for the following summer as soon as possible after the close of the construction season. This would mean a change in the usual procedure of many state and other highway departments, but it would be possible in most cases and would bring other benefits besides helping out transportation problems.

The points touched upon in the foregoing are the chief ones covered by President Coleman. They demand careful study, followed by concerted action, not only by the members of the American Road Builders' Association, but by all the road builders of the country.

Farm-to-table Week

The week before Thanksgiving, Nov. 15 to 22, is to be "Farm-to-Table Week." The plan is backed by the Federal Highway Council, which has secured the cooperation of the National Grange, the American Automobile Association, and other national organizations.

The object of the week is to encourage motorists to turn their pleasure trips into the country to utilitarian purposes by buying produce directly from the farmers. Those back of the movement urge that this be done as much as possible during the week designated.

It is argued that very few automobilists make a practice of doing this and that the reasons are that the farmers do not display their wares and that the motorists do not know how they will be received if they do stop and attempt to make purchases.

If the practice were more common, it is believed that farmers would give more attention to the raising of perishable, easily carried foodstuffs. At present this part of the farmer's work is not carried on as extensively as it might be, because of the difficulty of marketing the produce.

It is hoped that motorists will respond to the appeal during the next week and that as a result the farmers, especially those near the large centers of population, will devote more attention to this business next season.

Federal Guideboard Law

A Bill Providing for Cooperation of Post Office Department with Locat Authorities in Erecting Signs Introduced in Congress

Motorists would no doubt welcome the passage of the bill now before the Committee on Post Offices and Post Roads for the construction, erection, maintenance and protection of guideboards and guideposts on rural post roads.

The proposed bill was introduced by Congressman Stephens, of Ohio, and provides that the Postmaster General be authorized to cooperate with the states through their respective state highway departments, good roads associations, automobile clubs and individuals in the construction, maintenance and erection of such guideposts, the specifications to be prepared for a uniform style or styles of guideboards and guideposts bearing the insignia "Property of the United States" in addition to inscription of directions and distances thereon.

The increased amount of motor travel, for pleasure and otherwise, and the constant use of rural roads for such travel, has made necessary the guideboard bearing directions, and the support of the proposed bill by motorists is assured.

Pennsylvania Counties Vote Bonds

Five Counties Vote for Road Issues Amounting to a Total of $4,500,000

In the election on Nov. 4 five Pennsylvania counties joined the already large list of counties that are undertaking to bond themselves to secure money to pay their shares of the cost of constructing modern highways. The Commonwealth of Pennsylvania is paying all of the cost of constructing the primary road system, as planned by Governor Sproul and State Highway Commissioner Lewis S. Sadler. Numerous counties, during the past six months, have issued bonds for the construction of secondary highways which will "tie in" with the state's primary system.

Bond issues approved by voters at the election are as follows: Bradford County, $1,000,000; Indiana County, $1,000,000; Venango County, $1,000,000; Lawrence County, $1,000,000; Lycoming County, $500,000.

Many townships in these five counties also had bond issue propositions before the voters. So far as the State Highway Department has been able to learn none of these townships voted against the bond issue.

State Highway Commissioner Lewis S. Sadler was greatly pleased with the progressive spirit displayed in Bradford, Indiana, Venango, Lawrence and Lycoming Counties.

"It is evidence," he said, "that the several counties of Pennsylvania are determined to join with the State Highway Department in giving the Keystone State the best highway system in America."

Voters of Huntingdon County defeated by a small majority a proposition to bond that county for $500,00 for road purposes.

Lighting the Lincoln Highway throughout its entire length has been proposed by an organization of Toledo, Ohio. It is urged by the advocates of the plan that motoring by night is growing in popularity and that the travel over the highway will be twice as heavy in 1920 as it has been this year.

Union County ,Oregon, has voted a $1,500,000 road bond issue by nearly four to one, in spite of bitter opposition from the rural districts and the grange. The funds secured from the issue, it is stated, will suffice for the building of 125 mi. of hard-surfaced roads and 600 mi. of graveled laterals, if matched by state and federal funds.

The Second-Class Townships of Pennsylvania will have expended over $25,000,000 on earth roads in three years by the end of 1919, according to recent figures compiled by the State Highway Department. The amounts spent in 1917 and 1918 were $6,122,812.75 and $8,972,190.67, while this year's expenditure is estimated at about $10,000,000.

The Number of Motor Vehicles in Mexico City, according to statistics printed in a recent issue of the "Commerce Reports," is 5,493, divided as follows: Pleasure cars (private), 2,337; pleasure cars (for public use,) 1,916; jitneys, 1,104; motor trucks, 136. The total number of cars in the Mexican Republic is 18,000. The report is also authority for the statement that dealers in Mexico City estimate that 2 per cent. of the population of that city is able to purchase cars and that the roads are in bad condition and that little is being done to improve them.

Twenty-eight Million Tires Yearly are now necessary to equip the passenger automobiles and motor trucks in use in the United States, according to a recent statement from the American Automobile Association. To this should be added 12,000,000 more tires, for many vehicles accumulate mileage to such an extent that a second set of shoes is necessary to say nothing of the thousands of inner tubes. These 40,000,000 tires and their inner tubes, at an average cost of $25, make the total annual tire expenditure for road travel and transportation in the United States $1,000,000,000.

The Oregon State Highway Commission recently awarded contracts for about $500,000 of road construction. The contracts included one for the paving of a portion of the Columbia River Highway at a cost of nearly $230,000; one for macadamizing on the Pacific Highway at a cost of about $30,000; one for the construction of a road between McMinnville and Dayton at a cost of about $68,000; one for the completing of a portion of the Columbia River Highway in Sherman County at a cost of about $207,000, and one for work on the road between Hood River and Mosier at a cost of about $31,000.

MEETINGS

Calendar of Coming Meetings

Nov. 11-14—American Society for Municipal Improvements—Annual convention, New Orleans, La. Secretary Charles Carroll Brown, Valpariso, Ind.

Dec. 8-10—Southern Commercial Congress—Eleventh annual convention, Savannah, Ga. Director General, Southern Building, Washington, D. C.

Dec. 8-11.—American Association of State Highway Officials.—Annual meeting, Louisville, Ky. Chairman, Geo. P. Coleman, State Highway Commissioner of Virginia, Richmond, Va.

Jan. 15-16, 1920—Southern Appalachian Good Roads Association—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Feb. 9-13, 1920—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Apr. 12-17, 1920—United States Good Roads Association.—Eighth Anual Convention, Hot Springs, Ark. Director General J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Apr. 16-17, 1920—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

American Road Builders Association'

The annual meeting of the American Road Builders' Association was held at the Automobile Club of America, New York, N. Y., on Friday, Nov. 7. A meeting of the board of directors took place at 9:30 a. m., and was followed by a technical session at 10:30. After luncheon, served in the grill room of the club, a combined technical and business session was held. About 75 members attended.

On calling the meeting to order President Blanchard announced that the program would be somewhat of a departure from that of other annual meetings in that it included final reports from seven committees and action on a resolution.

The committees referred to were those on "Uniform Highway Signs," "Convict Labor on Highway Work; Organization, Administration, Camps and Cost Data," "Sources of Supply of Unskilled Labor for Highway Work," "Civil Service Requirements for Highway Engineering Positions," "Economic Status of Guarantees for Pavements on Roads and Streets," "Methods of Strengthening and Reconstructing Highway Bridges for Heavy Motor Truck Traffic," and "Reconstruction of Narrow Roadways of Trunk Highways with Adequate Foundations and Widths for Motor Truck Traffic." These committees submitted progress reports at the annual convention held in New York City last February.

The resolution to be acted upon by the meeting was as follows:

"RESOLVED: That federal aid funds should be used only for the construction of trunk line roads and bridges of adequate width and strength."

After making this announcement, President Blanchard appointed Col. W. W. Crosby, the former treasurer of the association, to audit the accounts of the fiscal year of 1918-1919. He also appointed the following resolutions committee: Geo. P. Coleman, Chairman, Col. H. L. Bowlby, Col. W. W. Crosby, F. E. Ellis, J. W. Hunter, H. G. Shirley, W. R. Smith and C. M. Upham.

A representative of the Lakewood Engineering Co. was granted the floor and invited the members present to be the guests of that company the next day on an inspection trip to a road in New Jersey on which one of the company's concrete finishing machines was being used.

The report of the committee on "Uniform Highway Signs" was then presented by the chairman, Robert A. Meeker, formerly State Highway Engineer of New Jersey. It was moved and seconded that the report be adopted and the motion was carried unanimously after a discussion by Messrs. MacDonald, Kenyon and Upham.

The report of the committee on "Convict Labor for Highway Work; Organization, Administration, Camps and Cost Data" was then called for. The chairman, State Highway Commissioner Geo. P. Coleman of Virginia, said that, after consultation with the members of the committee, it had been decided that litle or nothing could be added to the progress report submitted at the convention in February, and asked that the progress report be accepted as final. In reply to a question as to the contents of the progress report Chairman Coleman reviewed it briefly and it was voted to accede to the committee's request and accept the progress report as final. (The progress report was printed in a former issue of "Good Roads," p. 189, Vol. XVII—Ed.)

The chairman of the committee on "Sources of Supply of Unskilled Labor for Highway Work," Paul D. Sargent, Chief Engineer of the Maine State Highway Commission, was not present. President Blanchard said that the progress report presented at the February convention was very complete and definite and that it had been unanimously adopted and had also been printed and sent to the governors of the several states. It was then voted that the progress report be adopted as final. (See p. 111, "Good Roads," Vol. XVII—Ed.)

In calling for the next report, that of the committee on "Civil Service Requirements for Highway Engineering Positions," President Blanchard said that the chairman, Henry G. Shirley, Secretary of the Highway Industries Association and of the Federal Highway Council, had been seriously ill during and preceding the annual convention and that on that account the report to be presented would be the first received from the committee. Chairman Shirley then presented the report which, after several amendments had been made, was adopted.

During the discussion of Mr. Shirley's report a special delivery letter bearing on the report of the committee on "Sources of Supply of Unskilled Labor for Highway Work" was received from Chairman Sargent. It was therefore voted to reconsider the action taken by the meeting on that report, and President Blanchard read Mr. Sargent's letter and the conclusion of the progress report. It was then voted that the conclusion of the progress report be amended to read as follows:

"From the reports furnished by state highway departments, city departments and contractors, supplemented by the positive statements by officials of the War Labor Policies Board, and pending legislation to prevent a period of unemployment, your committee was forced, at the time of the annual convention, to the conclusion that there would be a sufficient supply of unskilled labor for highway projects during the season of 1919 and at wages slightly less than those prevailing during the season of 1918."

It was also voted to add to the conclusion the following paragraph from Mr. Sargent's communication:

"Instead of a plentiful supply of common labor at a less wage than in 1918, as seemed probable last February, there has actually been a shortage of common labor and wages have been higher than ever before. It seems probable that this condition will continue for several seasons."

President Blanchard then appointed Messrs. Kenyon and Durham tellers to count the ballots for officers and directors and called upon Col. Crosby to address the meeting. Col. Crosby, who has recently returned from service in France gave an interesting talk upon the roads in that country and expressed the belief that in another year the French would have their highways in good condition again.

At the conclusion of Col. Crosby's address the meeting adjourned for luncheon.

The first matter coming before the meeting in the afternoon was the report of the committee on "Economic Status of Guarantees for Pavements on Roads and Streets." It was presented by the chairman of the committee, Francis P. Smith, of Dow & Smith, and was adopted.

President Blanchard then read a letter from Willis Whited, Bridge Engineer of the Pennsylvania State Highway Department, who was chairman of the committee on "Methods of Strengthening and Reconstructing Highway Bridges for Heavy Motor Truck Traffic." No action was taken on the report, the president pointing out that under the association's rules the committee would go out of existence on that day and that the president-elect could take such action as he saw fit in regard to its continuance.

The report of the committee on "Reconstruction of Narrow Roadways of Trunk Highways with Adequate Foundations and Widths for Motor Truck Traffic" was presented by the chairman, H. E. Breed, consulting engineer, of New York, N. Y. The committee requested that the report be considered a progress report and the meeting accepted it as such, after several amendments had been proposed and adopted.

Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment of New York City, who was to have opened the discussion on the resolution set forth in a preceding paragraph, was not present, but sent in a written discussion which was read by George C. Diehl, County Engineer of Erie County, New York. After a discussion participated in by Messrs. Howard, Shirley, Ellis, Kenyon, Diehl, MacDonald, Sharples and Mehren, the resolution was tabled.

The following motion was then made by Mr. Diehl and was carried:

"Moved: That the American Road Builders' Association expresses its great interest in the matter of federal aid; that the subject be made one of the topics of discussion at the next annual convention; and that a committee be appointed to formulate the plans for the discussion, including a request to the Bureau of Public Roads to present the situation as it views it."

The report of the board of directors, in which were included the annual reports of the secretary, the treasurer and the executive committee, was then presented and accepted. The report also included the following resolution:

"Moved and carried that the proposed schedule of salaries for egineers in state highway service, as proposed by a committee of the American Association of Engineers, be approved by the board of directors, with the exception that the word 'estimators' be struck out from the general classification, and that the schedule as amended be submitted to the annual meeting with a recommendation to adopt."

The next matter taken up was that of the proposed amendments to the constitution. Upon a motion by Mr. Diehl the several amendments were adopted as follows:

Article V. Section 3, shall be amended to read as follows:

Life members shall consist of active members making a payment of Fifty Dollars ($50.)

Article V, Sec. 4, shall be amended to read as follows:

Sustaining members shall be companies or organizations who contribute one hundred dollars ($100) per year, such membership to carry with it one (1) active membership or one (1) vote.

Article VI, Section 5, shall be amended to read as follows:

Contributing members shall be companies or organizations who contribute twenty-five dollars ($25) per year, such membership to carry with it one (1) active membership or one (1) vote.

Article VII, Section 1, shall be amended to read as follows:

The officers of this Association shall be selected from its active membership and shall consist of a President, four Vice-Presidents, one (1) of whom shall be elected from each district, a Secretary, a Treasurer, and twenty-one (21) Directors, who, together with the last five (5) living past Presidents, shall constitute a Board of Directors, from which shall be elected an Executive Committee of five (5), two of whom shall be the President and the Secretary of the Association and not less than two (2) others shall be residents of the Northeastern District.

After passing a vote of thanks to the Automobile Club of America for the use of its rooms, the result of the election of officers was announced at follows:

President, Geo. P. Coleman, State Highway Commissioner of Virginia; Vice President, Northeastern District, J. A. Duchastel, City Engineer, Outremont, P. Q.; Vice President, Southern District, Prof. R. D. Kneale, Atlanta, Ga.; Vice President, Central District, Prof. Robert C. Terrell, University of Oklahoma, Norman, Okla.; Vice President, Western District, S. Benson, Chairman, Oregon State Highway Commission; Secretary, E. L. Powers, Editor, "Good Roads"; Treasurer, James H. MacDonald, Former State Highway Commissioner of Connecticut.

Directors (for three years): Northeastern District: Frederick E. Everett, State Highway Commissioner of New Hampshire; T. J. Wasser, County Engineer of Union County, New Jersey, and M. F. Bramley, President, Cleveland Trinidad Paving Co., Cleveland, Ohio. Southern District: Chas. M. Upham, Chief Engineer, Delaware State Highway Department. Central District: J. Frank Smith, General Manager, Kansas Good Roads Associatin; H. K. Bishop, State Highway Engineer of Indiana. Western District: Samuel Hill, Seattle, Wash.

After the announcement of the result of the election, the retiring president, A. H. Blanchard presented the newly elected president who spoke briefly of the various problems confronting road builders and of the association's part in their solution This address is printed on other pages of this isue

After a vote of thanks to the retiring president, the meeting adjourned.

PERSONAL MENTION

William G. Edens, President of The Associated Roads Organizations of Chicago and Cook County, formerly assistant secretary of the Central Trust Company of Illinois, on October 28 was made vice president for the department of new business.

I. S. Byrum has been appointed general manager of sales of the Troy Wagon Works Co., of Troy, Ohio, succeeding R. C. Sykes, resigned. Mr. Byrum has been with the company for the past eight years, as salesman, special representative and assistant to Mr. Sykes.

Captain P. H. Brigham, 130th Engineers, formerly assistant engineer with the New York State Highway Department, has recently been discharged from service and has entered the Paving Department of the Lakewood Engineering Co., Cleveland, as field engineer for New York, New Jersey and New England.

T. Keith Legare has resigned as city engineer of Columbia, S. C., to open an office in that city for private practice as consulting engineer. Mr. Legare, who has been city engineer for three years and was previously connected with the city engineer's office for eight years, will specialize in highway and municipal engineering.

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NEW YORK, NOVEMBER 19, 1919
Number 21

Reconstruction of Narrow Trunk Highways[*]

Progress Report of the Committee of the American Road Builders' Association on "Reconstruction of Narrow Roadways of Trunk Highways With Adequate Foundations and Widths for Motor Truck Traffic"

Your committee on "Reconstruction of Narrow Roadways of Trunk Highways with Adequate Foundations and Widths for Motor Truck Traffic" submits for your consideration only a report of progress at this time, for your committee realizes that it would be unwise to draw definite conclusions from factors which are still indefinite in the building of roads and pavements.

In our preliminary report we subdivided our topic into the following heads as being best adapted for our discussion.

1. Width
   (a) of the pavement
   (b) of the shoulders
2. Drainage
   (a) surface
   (b) sub surface
3. Foundations
   (a) of new construction
   (b) of previous construction
4. Pavement surfaces
5. Desirability of maintaining traffic during construction
6. Economic improvement of line and grade

Your Committee realizes that in the choice of these elements for discussion it has restricted the scope of work. I think you will all agree that the line had to be drawn somewhere, as the topics above may be interpreted broadly enough to cover the essentials of our subject.

1. Width.—Your Committee reaffirms its recommendation on width, that is, that the paved surface of the roadway on trunk highways should be at least 20 ft. in width.

For each additional line of traffic 9 ft. more should be added.

Your Committee recommends that the minimum of the shoulder be 5 ft. except in cases where new right of way is to be acquired; then the additional width of shoulders should be at least 9 ft. in order that, should additional traffic require it, four lines of traffic may be accommodated without requiring additional right of way.

2. Drainage.—Your Committee reaffirms its recommendation that the present drainage systems be examined and placed in such condition that they will function properly.

Such additions should be made as are necessary to keep the subgrade dry.

We suggest that where underdrains are necessary, they be placed alongside of the pavement and not directly under it. The advantage of this method is that they can be cleaned without disturbing the pavement surface, and to a large extent safeguarded from vibration which has a tendency to fill them up. It has been found in many cases that a line each side of the pavement requires less linear feet of drain than a single line with spurs running under the pavement.

3. Pavement.—(A) Where a new construction, your Committee reaffirms its recommendation that all foundations be of concrete.[†] We do not recommend thickness for the different kinds of foundation because the data in regard to experiments being carried on by the Federal Government are not yet available. Valuable as these will be, we believe that before definite recommendations are made they should be supplemented by reports of traffic census and service conditions on many types of road now in use in order that we may properly anticipate the motor truck need of the future.

(B) Where the present pavement can be utilized, your Committee recommends that the widening be of the same kind of construction as the portion to be utilized. Where, however, it appears feasible to anticipate future needs, then we recommend that the widening be of a type appropriate to them. It is suggested that when widening a pavement, edging be used to prevent lateral movement.

(C) No definite conclusions have been formed as yet with regard to bituminous macadam foundation. The cases that have been brought to the attention of the Committee are so limited in extent that the Commitee is not prepared to make a definite recommendation at this time.

4. Pavement Surfaces.—Your Committee recommends that pavements on trunk line highways be of concrete; brick; wood block; stone block; asphalt block or bituminous concrete (of the mixed type.)[‡]

5. Desirability of Maintaining Traffic During Construction. —Your Committee wishes to suggest that all detours be made adequate for the traffic that they must carry; that they be maintained during the time of detour and that they be put in passable shape at the completion of the work. The expense of the detours is assumed by the governing body doing the main construction work.

Your committee also suggests that where there are two main lines in the same direction between two centers of population, only one should be improved at the same time, in order that traffic may have one through route at its disposal.

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[*] Presented at the annual meeting, New York, N. Y., Nov. 7, 1919.

Committee: H. Eltinge Breed, Chairman, Prof. T. R. Agg, Maj. F. A. Reimer, W. G. Thompson, Lieut. Col. W. D. Uhler, Chas. M. Upham.

[†] Amended by adding the words "or other materials used so as to give equivalent strength."

[‡] Amended by including also "sheet asphalt."

We, as a committee, reaffirm our statement that the best possible methods should be used to maintain traffic.

6. Economic Improvement of Line and Grade.—Your Committee recommends a thorough study of line and grade in order that sharp turns and steep grades may be eliminated at the time of reconstruction.

It is suggested that greater safety may be had by cutting back existing banks on the inside of the curves, thereby giving greater sight distance. In all reconstruction work curves should be eased to give a greater sight distance.

We present the above report as one of progress only. There is so much of vital interest to road builders on the subject given this committee, that we beleve work should be continued along this line in order that the Association may have the benefit of investigations that are now under way.

——ooo——

The Proper Use of Federal Aid Funds*

Discussion of the Resolution: "Resolved: That Federal Aid Funds Should be Used Only for the Construction of Trunk Line Roads and Bridges of Adequate Width and Strength"

By NELSON P. LEWIS†

The following is intended to serve as a brief introduction to the discussion of the above resolution adopted by the Executive Committee of the American Road Builders' Association with the idea that it would be submited to the next meeting of the Association for general discussion.

Before considering the specific resolution, a brief reference will be made to the policy of the United States Government with respect to internal improvements. Such improvements have generally been considered functions of the states rather than of the Federal Government. While the improvement of waterways connecting with other waterways already navigable has long been one of the obligations assumed by the nation and appropriations carried by the various river and harbor bills have lately assumed enormous proportions, the construction of artificial waterways or canals has quite consistently been left to the states. The Federal Government has undertaken extensive irrigation projects through the Reclamation Service and the working capital provided for the purpose is supposed to be replenished through payments by the holders of lands converted from arid to fertile. The reclamation of swamp lands by the construction of drainage canals has been agitated, but little, if anything, has been done in this direction.

The propriety of the building of roads and the carrying out of other internal improvements by the United States Government has been the subject of debate for nearly a century. A bill for the improvement of the Cumberland Road was vetoed by President Monroe in 1822 on constitutional grounds. In 1824 a constitutional amendment giving Congress the power to build roads and canals, the funds to be apportioned among the states according to population, was discussed but not adopted. In 1825 the proposed appropriation of $150,000 to extend the Cumberland Road and a federal subscription to build the Delaware and Chesapeake Canal and the Dismal Swamp Canal were subjects of bitter controversy, which was revived in 1828. In his inaugural address in 1825, John Quincy Adams favored the policy of internal improvements but in 1830 President Jackson vetoed a bill providing for the improvement of the Maysville Road in Ohio, as the road was laid out wholly in that state and did not connect with any existing system of improvements.

In the early 1830's the subject of internal improvements had a conspicuous place in presidential messages and congressional debates, and one of the arguments was that if the Erie Canal, finished in 1825, was of such great benefit and made its builder famous, other schemes should prosper further west where the country, then developing, sorely needed such improvements.

The idea of apportioning federal funds among the states reached a climax in 1836 when Congress passed a bill providing that all of the money above $5,000,000 in the United States treasury on January 1, 1837, should be deposited with the several states according to their population in four quarterly installments. According to the law, this was to be a loan but Henry Clay said that "not a single member of either house imagined that a dollar would ever be recalled." The first quarterly installment, amounting to $9,367,000, was paid on January 1, 1837, and the withdrawal of the money from the federal deposit banks resulted in great financial disturbance, which it was predicted would be still more serious when the second payment was made. This proved to be the case for that payment was made on April 1st and within the next week there were 100 failures in New York alone and 28 more within the next three days. Since that time there has been little discussion of apportioning federal funds among the states.

But new conditions have arisen. The extraordinary development of the automobile for pleasure riding created an irresistible demand for better roads and the several states, heeding this demand, embarked upon extensive programs for road improvement. The equally notable development of the motor truck and the demonstration of its possibilities for the collection and distribution of goods compelled the construction of more substantial roads, which would be a long step in the direction of national highways. And now the Federal Government has assumed a share of the expense and has set aside large sums for this purpose, these to be apportioned among the several states in proportion to their area, population and present road mileage, with the proviso that each state will itself provide a sum equal to its allotment.

It is, of course, natural and proper that the Federal Government, a partner of the states in this enterprise, should exercise some degree of control over the selection of the roads to be improved, the class of roads to be built and the manner in which the work is carried out.

It is the class of roads to be built which is the particular subject of the resolution already referred to. The policy of the states has quite naturally been to construct as great a mileage of roads as possible, realizing that the value of a state road system is dependent in no small degree upon its completeness and also upon the promptness with which it can be made available. In order to make the mileage as great as possible and distribute the benefit as widely as may be, the cost per mile has been kept down by reducing the width and thickness and by omitting rectifications of line and improvements of grade, which are obviously desirable. While the propriety of the financing of such road improvements by the issue of long term bonds cannot be defended, the immediate benefit of the policy just outlined has been very great and has been considered, and it really is, state-wide. When,

(Concluded on Page 222)

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*Read at the annual meeting of the American Road Builders' Association, New York, N. Y., Nov. 7, 1919.

†Chief Engineer, Board of Estimate and Apportionment, New York City.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Vol. XVIII NOVEMBER. 19, 1919 No. 21

RECONSTRUCTING TRUNK LINE ROADS FOR HEAVY TRAFFIC

At the annual meeting of the American Road Builders' Association the report of the Committee on "Reconstruction of Narrow Roadways of Trunk Highways with Adequate Foundations and Withs for Motor Traffic" was presented by H. E. Breed, the chairman of the Committee.

The presentation of the report provoked a lively discussion and the decision unanimously reached was against the adoption of an exclusive type of foundation for trunk line highways. In the discussion many examples were mentioned of roads constructed of macadam, telford, cement concrete and asphaltic concrete foundations which have in practice stood the severe test of modern traffic.

The necessity was brought out of building as many miles of improved roads as possible, but it was made clear that some roads must be built wider and some thicker than others and that in order to conserve money local material should be used as far as possible. Before road work is undertaken, facts must be fully ascertained and the road built to carry the traffic required of it.

It is evident that for a connected and well-developed system of highways, approximating even 20% of the total highway mileage of the country, a large percentage must be built of the less expensive types, but all the standard types should have their place in the system.

The report of the Committee was received and adopted as a progress report. After adopting the amendments offered, including one that sheet asphalt should be included with the other types of pavement recommended for new construction on main trunk lines, the Association voted that the title of the Committee should be changed to "Reconstruction of Narrow Roadways of Inter and Intra State Trunk Highways with Adequate Foundations and Widths for Intensive Motor Truck Traffic."

The subject is one of much moment in road building and it is to be hoped that the new Committee will take up the work and present a further report for discussion at the annual convention of the Association in February next.

THE USE OF FEDERAL AID ROAD FUNDS

Though characterized by their author as perhaps "somewhat severe," it would hardly seem that there could be any great difference of opinion as to the soundness of the requirements for the use of federal funds for road work set forth by Nelson P. Lewis in the discussion of federal aid at the recent meeting of the American Road Builders' Association. They were contained in the concluding sentences of a discussion of a resolution that was before the association, and are printed on other pages of this issue.

The characteristic clarity and force of Mr. Lewis' discussion of the subject can not be enhanced by anything we can say here, but it may not be amiss to direct attention to some of the points that should be emphasized.

One of these points is made in the first two requirements laid down by Mr. Lewis—that federal funds shall be used only for roads connecting with roads to be similarly improved in other states and that the roads selected for improvement with federal funds shall be those affording direct routes for through traffic across states or leading to established industrial or commercial centers. This requirement—or these requirements—if met, would prevent a repetition of the policy followed in some states of building "patchwork" systems of roads "beginning nowhere and ending nowhere," but fully meeting local demands and the requirements of petty politics. Money from the national treasury should be used for national roads, that is for roads meeting national needs; and political considerations should be allowed to influence the selection of the roads to be improved no more than is unavoidable under the limitations of human nature.

Another point that may well be emphasized is that of the necessity for providing for the proper drainage of the roads. No detail of construction is more important—or, as a rule, more neglected in practice. A well built drainage system that is kept in good condition all of the time will make a good road better and, often, a poor road almost good.

The last point to which we would direct especial attention is the requirement that all federal aid roads shall have characteristic features such as uniform signs, guard-rails, bridges and the like to distinguish them from other roads. Highways are built for use and their value must be measured in terms of use. Everything, therefore, that adds to their usefulness is desirable and proper markings are certainly additions to any road.

The other requirements are of very great importance, but it seems that these three deserve special attention.

ooo

In Order to Explain to the Merchants and Manufacturers of Washington, D. C., the advantages that would accrue to them by the completion of the concrete road between Washington and Alexandria, a meeting of a special highway committee of the Chamber of Commerce was held recently. Representatives of fifteen large Washington firms were present at the meeting and promised on behalf of their respective firms to interest other merchants as well as lend financial support toward completing the road. The chairman of the meeting appointed each of the 15 representatives a committee of one to canvass the firms in his block for contributions. To accomplish the object for which the meeting was called $25,000 was necessary and it was the sense of those present that the full quota would be available within ten days.

Concrete Test Road in Pennsylvania

A test pavement of cement concrete is being built near Harrisburg by the Pennsylvania State Highway Department.

The road consists of 21 sections each 70 ft. long and each built of concrete made from materials obtained from different parts of the state. The main purpose is to cheapen the cost of concrete road building by ascertaining the suitability of local materials.

The experiment is in charge of Deputy Commissioner Biles and W. A. VanDuzer, Assistant Maintenance Engineer.

District Engineers Appointed in Virginia

Virginia has been mapped into districts, and State Highway Commissioner George Coleman has appointed an engineer for each of them as well as for the eight subdivisions into which the state has been divided. Approximately $60,000,000 will be available for highway construction in this state within the next six years.

Resident engineers have been named for some of the larger cities of the state, with central headquarters at Richmond. C. S. Mullin and A. H. Pettigrew will be in charge of the two main divisions, and the men to serve in the subdivisions are: Maj. W. I. Lee, Richmond district; E. R. Cocke, Staunton; J. B. Keeler, Bristol; J. J. Forrer, Manassas; A. H. Bell, Tappahannock; Maj. G. T .Lemmon, Suffolk; Gill Magruder, Lynchburg; W. H. McConnell, Roanoke.

The Proper Use of Federal Aid Funds

(Concluded From Page 220)

however, the federal treasury is to be drawn upon for half of the cost, the problem assumes a very different aspect. Roads improved at joint expense should be considered as interstate or national highways. Federal funds cannot properly be used simply to increase the mileage of state roads for more or less local use, or even to complete a system which will be of the greatest general benefit to the people of the state.

The individual states could scarcely afford, and it would be unfair to ask them, to construct at their sole expense roads of additional width and of extra strength in order that they may carry the heavy traffic brought to them by roads traversing other states or to pay the entire cost of building such sections of great transcontinental trunk highways as happen to pass through them. Such roads will undoubtedly be a great advantage to the states, but they will also be of great national value.

The Federal Government, through its Bureau of Public Roads, might very properly, yes, should insist upon the following requirements wherever national funds are to be used to supplement those to be provided by the states:

1. Such funds shall be restricted to the improvement of roads connecting directly with roads in adjoining states which are to be similarly improved.

2. The roads selected for improvement shall be such as will afford direct routes for through traffic across the states or lead to established industrial and commercial centers.

3. The paved width shall be sufficient to accommodate not less than three lines of traffic with a minimum of 24 ft.

4. The strength of surface and foundation shall be ample to carry the heaviest allowable wheel loads and the states should, as a condition of the allotment of funds, be required to enact reasonably uniform laws governing such loads.

5. Bridges and culverts shall be constructed of sufficient strength to carry the greatest permissible loads.

6. Thorough drainage of the roadside with subsurface drains, where needed, will be insisted upon.

7. Alignment and grades, if objectionable for heavy traffic, shall, within reasonable limits of cost, be improved to as great a degree as the topography permits.

8. All roads so improved should have some characteristic feature, such as uniform signs, mile-posts, guard-rails, bridges, retaining walls, etc., to distinguish them as national highways.

These requirements may be somewhat severe, but in view of the very large contribution of national funds, they can scarcely be considered unreasonable, while it is important that the allotment is not looked upon as a gratuity but as a payment for something which will serve a purpose truly national.

Road Material Testing at the University of Texas

Since the first of the year, over 350 samples of road building materials have been tested at the road material testing laboratory of the University of Texas, according to a recent statement.

The laboratory was established several years ago and has played an increasingly important part in Texas road work. The apparatus used in the laboratory's work represents an investment of between $4,000 and $5,000, and comprises the usual machines and appliances employed in similar work elsewhere, including a 100,000-lb. testing machine.

The great impetus given to road work in Texas during the past two or three years by the granting of state and federal aid, has greatly increased the volume of work done in the laboratory. The testing is done free and tests have been made on materials from practically every county in the state.

Plans for the Campaign of the New York State Motor Federation for $100,000,000 for permanent improved highways in New York State will be drawn up at the annual meeting of the Federation to be held in Utica, N. Y. on Dec. 9 and 10. The plan already has a decided backing, due, no doubt, to the wide publicity given it.

The Townsend Bill was sidetracked at the session of Congress just ended, according to a statement from the Federal Highway Council, on account of the urgent and important questions before that body. Senator Townsend stated at a recent conference, that he believed it would be impossible to hold hearings on the bill until some time in December or near the first of the year. At that time, however, the Commitee would immediately hold hearings and put the Bill in final form to be presented to the Senate, he said, and it is, therefore, important that anyone wishing to make suggestions in regard to any amendments immediately send them in.

The State Highway Department of Connecticut has expended $500,000 remodelling the old railroad bridge across the Thames River, which was donated to the state by the New York, New Haven and Hartford Railroad. With the severing of a silken ribbon stretched across the bridge and formal greetings by state officials and the town authorities of New London and Groton, the new bridge connecting the two towns, and filling the last gap in the shore line highway between Boston and New York was opened for business on Nov. 6. The bridge will accommodate thousands of automobiles, which hertofore had to wait for ferry service across the river, the records showing that by this means 200,000 automobiles, besides other vehicles, were transported in 1919. Two ferryboats handled the traffic.

HIGHWAY TRANSPORTATION

The Motor Bus vs. the Street Car

BY R. E. FULTON*

In a consideration of the reasons for the growing acceptance of the motor bus as an economic necessity in passenger transportation, it is well to first examine the ultimate effect of increases in population upon traffic facilities. While the necessity for immediate action to solve serious congestion problems is now being felt only by the larger cities, the requirements of smaller cities and their future development deserve just as much consideration to prevent this congestion in years to come.

Traffic facilities may be divided into two classes, public utility transportation lines, and highways to accommodate privately owned vehicles.

It is evident that the traction lines are becoming more and more inadequate to handle the congestion that is increasing every day. Since the amount of traffic they will hold is limited by the tracks on which they run, it will be impossible for them to keep up with the growing needs of transportation unless new tracks are laid. This, however, is prohibited by the increasing congestion of privately owned vehicles on the highways. Increasing population on the one hand demands better highway facilities. Can one factor be satisfied except at the expense of the other?

The present serious financial condition of these public utility corporations throughout the country is bound to mean increased fares and the burdens imposed upon them by increasing population are bound to mean more and more congestion. The motor bus will not only solve the serious traffic problem, but will provide the public with a more flexible, satisfactory mode of transportation at a lower cost.

In the majority of large cities it is out of the question to lay more tracks for surface car lines in thickly populated business and residential sections—there is no room for them. In view of this fact it is only logical to assume that motor buses will be used to relieve the congestion, as they are free to operate on any route without tracks. And it is very possible that the time will come when traffic will have increased to such an extent that the streets will seem unable to hold it.

INTERIOR VIEW OF BUS SHOWN IN LARGE ILLUSTRATION

A 3½-TON MACK TRUCK CHASSIS EQUIPPED WITH SPECIAL BUS BODY—SEATING CAPACITY 30 PASSENGERS—ELECTRIC LIGHTED—HEATED FROM MOTOR EXHAUST

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*Vice President, International Motor Co.

In this event the only solution would be the discontinuance of surface car lines and the substitution of motor buses. This for the simple reason that buses do not block the highways, being flexible and able to move about in traffic. Surface cars, on the other hand, do block traffic—this fact cannot be denied.

So far as less thickly populated sections are concerned, there is every reaso to believe that future development of transportation facilities will favor the motor bus. The laying of tracks for a surface car line represents a huge initial expense for right of way, bridges, grading and rails. If such a line does not prove profitable, it cannot be diverted. The flexibility of the motor bus system, however, does not confine it to any one fixed route.

Public utility corporations everywhere are gradually losing the faith of investors. Their inability to increase fares to keep up with increasing costs of operation considerably decreases their dividends. In view of this, it is becoming increasingly difficult to find investors who will lend the money to build and equip new traction lines, while far better inducements are offered in other securities.

Efficiency and economy of operation are in favor of the motor bus. This has been proved in New York City by the success of motor bus lines established to take the place of traction lines that could not pay for themselves. Then too, when Brooklyn traction companies raised their fares and people refused to pay the advance, a fleet of motor buses solved the problem by taking the Brooklynites to their places of business. They not only were able to operate profitably on the lower fare basis, but proved to be quicker and far more comfortable than the trolley lines.

These economies are principally due to the fact that the tremendous overhead expenses of the surface car lines are eliminated in the operation of motor buses. The bus is its own power plant and it consumes power only when in operation. Since it is speedier than the surface car, a bus can make more trips per day thereby increasing the revenue per unit of expenditure.

Motor bus routes offer many conveniences that cannot be offered by traction lines. Another point—they unload passengers at the curb which is much safer. In case of a blockade, a bus can detour. This fact alone works as a benefit in two ways—it makes a more dependable transportation system and tends to relieve the congestion incidental to blockades. Not being confined to tracks, buses can receive and discharge passengers near their homes. Then too, we have the obvious fact that people would rather ride in a motor bus not only because of its conveniences but because of the suggestion it conveys of pleasurable outdoors.

A movement that had its inception in California and that is gradually spreading to other parts of the country is the use of motor buses to provide better educational facilities. By the consolidation of rural schools and the use of buses to carry the pupils to and from them, a more complete curriculum is offered to the children in rural districts. This is but one instance of the adaptability of the bus in the development of sparsely populated sections. Where a traction system is needed, but is too costly to be profitable, the economical motor bus can be relied upon to fill the need.

There are seasonable needs for transportation service that can only be filled by the motor bus . Summer resorts, for instance, often cannot support a surface car line the year through, while the bus can be diverted to other channels out of the busy season.

The motor bus is also a big factor in solving the industrial labor problem. Factory sites within city limits where labor is available, are scarce. The use of buses to carry employees to outlying sections where sites are obtainable is gradually being recognized as the logical solution to the problem.

A short time ago a party of ladies left Easton, Pa., in a pneumatic-tired motor bus to attend a matinee theater performance in New York City, a distance of 73 mi. by train. They left in the morning, arrived in plenty of time for the matinee and returned to their homes in the bus that same evening. Such illustrations of the potentialities of the motor bus make it easy to conceive the time when commuters will travel to business in buses more quickly and comfortably than by means of suburban trains. Metal laid roads designed for one-way motor traffic with no speed limit are inevitable.

All through the development of passenger transportation in every section, from the large city to the rural community, the motor bus will be felt more and more as the years go by.

The Motor Truck in Public Health Service in New York State

For the purpose of disseminating all forms of public health information, the New York State Department of Health has establishel a new agent, the "Healthmobile," to assist in its fight against disease in every corner of the state.

This agency for 100% health consists of a ¾-ton motor truck chassis, on which has been built a body designed with the general dimensions of a motor truck ambulance. The truck is equipped with a generator, independent of the engine, for producing the necessary electric current, a storage battery, a moving picture machine and a sectional screen which can be attached to the roof of the truck.

The truck will make its first appearance at county fairs before proceeding on its statewide tour.

Federal Road Building a Benefit to Farmers

Concentrating National Funds on National Roads Would Release Money of the States for Market Roads, According to National Automobile Chamber of Commerce Official.

The construction and maintenance of a nation-wide system of trunk highways by the Federal Government would go further than any other one thing toward giving the farmer efficient transportation, according to George M. Graham, of the Highways Committee of the National Automobile Chamber of Commerce. Continuing he said, in a recent statement:

"The ultimate effect of such a concentration will be to give us a network of highways designed to care for the main post road, military and interstate commerce needs of the country, but there is an important result which would come immediately with the passage of a measure providing for such construction.

"The moment that the National Government begins to take care of national highways, state highway departments will be able to devote their funds to the construction and maintenance of state and county systems. Since a very large proportion of highway traffic originates with the farmer, we may look forward to a tremendous impetus in the construction of market roads, which will at once lower the cost of transportation and serve to equalize distributing conditions.

"There is another factor which is coming more to the foreground each year. Not many years ago the farmer traveled his nine or ten miles to a market and sold his commodities at the price prevailing at that point. The motor unit has widened his range. If the market close to hand does not want his produce he can go 10, 20, 30, 40 mi., even further, if need be, to obtain the best price, if the roads are good.

"As the Government pushes forward its national roads we will find an ever increasing stream of travel not only from the farm to the immediate market but from one market to another, so that our main roads will in a sense become market roads.

"The only way in which this result can be brought about quickly is through concentration of Government funds. It cannot be accomplished under the present method, which refuses to permit Government funds for maintenance and forces the state to concentrate either a large proportion or all of its funds on federal aid projects, in many cases to the exclusion of proper maintenance.

"Federal aid is all right as one step in highway construction, but it is only one step and should be supplemented by federal construction of federal roads. The measure introduced in Congress by Senator Townsend providing for a national highway system covers these points, and I believe that every farmer who makes a study of this subject will agree with the senator's solution of the problem."

Good Roads as Factors in Reducing Transportation Costs

Day Not Far Distant When Trucks Will Be Run Over Specially Built Highways

By E. A. WILLIAMS, JR.*

The day is not far distant when motor trucks will operate over highways built solely with that purpose in view.

When that day comes motor truck transportation will have reached its height.

The one big thing the war did for the motor truck was to provide it with an opportunity to prove its universal worth as a transportation factor. In other words, the war accelerated its general adoption in the commercial field. It is commerce and industry, not war that concerns us today.

All about us are evidences of the motor truck's utility. Each day sees it entering a new field of endeavor. I saw a moving picture a few days ago of a motor truck hauling cane brake in the Philippines. Oxen have been used there since the beginning of the industry. Down in India motor trucks are replacing elephants, oxen and men.

In South America they are supplanting the burro. In various sections of the world, hitherto unexplored and undeveloped, they blaze the trail for enterprise.

The remarkable thing about it all is that transportation by truck has not only proven itself more practical but more economical than the older means.

The Department of Agriculture estimates that for the year 1918, motor truck hauls from farms to shipping points averaged 11.3 mi., while wagon hauls averaged 9 mi. The motor trucks made 3.4 round trips per day over the 11.3 mi. while wagons made but 1.2 trips per day over the 9-mi. route.

The average cost per ton by the horse-drawn vehicles was 30 ct. per mile for wheat, 33 ct. for corn and 48 ct. for cotton. The truck haulage per ton-mile averaged 15 ct. for wheat and corn and 18 ct. for cotton. In several states the cost of transporting wheat was as low as 9 ct. per ton-mile while the lowest cost by wagon is estimated at 22 ct. per ton-mile. Quite a saving there, without taking into consideration the value of time saved and the economy in labor.

The figures compiled by the Government show definitely the importance of good roads in the reduction of costs. For instance, in the East North Central States, which boast miles of improved highway, the cost of haulage by truck was but 9 ct. per mile in 1918. In the New England States, the Middle Atlantic States and the West North Central States the cost was 14 ct. The cost increased to 18 ct. in the South Atlantic States where there are a limited number of improved roads and to 29 ct. in the Rocky Mountain district where, of course, the grades affect all means of transportation.

Contrasted with these figures are those showing the costs of hauling by horse-drawn vehicles. In the East South Central section, the cost is 36 ct. per ton-mile—more than three times the cost by truck. In the South Atlantic States it is 39 cts.—more than twice as much as by motor. In the Rocky Mountain district the cost reaches 42 ct.—13 ct. more than the truck costs.

After considering those figures one stops to wonder what the present cost of foodstuffs would be if it were not for the motor truck. Here is New York with more than 55,000 motor trucks registered. The average cost of hauling by truck in New York is 14 ct. per ton-mile, according to last year's figures. The cost by wagon is estimated at about 30 ct. There is a difference of 16 ct. on each ton per mile. In a year the saving would run into an enormous amount.

Indianapolis leads all other centers in the transportation of hogs by truck. This may be attributed, to a great extent, to the fact that it is the hub of a system of improved roads. These figures disclose the great advances made by the motor truck in the transportation field during 1918 and preceding years. In 1918, 462,313 hogs were received in Indianapolis against 271,994 in 1917; 173,191 in 1916, and 96,591 in 1914. Indications are, according to reports from the Hoosier capital, that 1919 will see the mark reach 600,000. This, of course does not include cattle and other livestock.

I have no figures at hand which will show the comparative cost of transporting livestock by motor truck and by wagon, but it may be taken for granted that the average differences which prevail in the transportation of wheat will prevail here also. The greater number of trips possible with the truck and the time saving alone is proof enough that it is more economical.

But to get into the future of transportation by truck: It is not necessary to state that it is a factor as yet only in the early stages of development. True, there are numerous truck trains, rural express routes and intercity routes operating in communities throughout the United States. Haulage concerns, alive to the situation, have amalgamated to reduce the possibilities of idle trucks and light return loads, and to render improved service to patrons. Many commercial houses and manufacturing plants are operating private lines. The Post Office Department has inaugurated parcel post routes. But, we may yet say that the motor truck has not even approached the height of its possibilities as a transportation factor.

The building of roads will control to a certain extent the immediate future of motor truck transportation. Good roads are essential to the most efficient results. They are just as important to motor truck transportation as good railroads are to railroad transportation. We have the rolling stock for motor truck transportation. The modern trucks have proved their ability to stand up. They are built for poor roads and to meet the most trying conditions. And they are making good under these conditions. What wouldn't they accomplish if they were aided by better roads?

It is not entirely impossible that motor trucks, at some future day, will operate over a system of highways built solely for motor truck transportation and separate and apart from the regular passenger car highways.

The not far distant future will produce roads which will be constructed of material particularly adapted to withstand heavy hauling. They will represent the shortest routes between important points, a fact that will make for lower costs per ton-mile.

Maintenance crews, not unlike those which constantly are at work on the railroad rights of way, will keep the system in repair at all times.

When that day arrives transportation by motor truck will have reached its height.

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*President Garford Motor Truck Co.

The State Highway Department of Pennsylvania recently received a letter from the chairman of the Permanent Roads Committee of Concord Grange, Cheyney, which reads in part as follows: "At the meeting October 27, of Concord Grange No. 1141, Patrons of Husbandry, it was unanimously voted that we notify you of our approval of the State Highway Department's construction of hard-surfaced roads. It was also voted that strict enforcement be given the new law regulating heavy truck travel, as we fear that within a few years these trucks will become so heavy as to break down the construction we may now think strong enough."

A motor vehicle is registered for every 24 persons in the United States. The proportion in Canada is probably one to 50; in England one to 200; in Denmark one to 300; and in France, Belgium, Holland, Switzerland and Germany, about one to every 400. In 1917 it was estimated that Italy had one car to 1,000 of the population; Portugal one to 1,690; Spain one to 1,900; Austria-Hungary one to 2,650 and Russia one to 5,000. In Australia there was one car for each 140 and in South America as a whole, one for 1,430. Many a minor city in the United States has more cars than the whole of China or Japan.

The demand for a national highway system has found expression in an unexpected quarter during the past week, according to a recent statement from the Federal Highway Council. Resort hotels have gotten behind the "See America First" movement in the hope of stimulating touring and so making up on automobile trade the loss in revenue caused by the closing of the bars, and it is realized that to make a campaign of that kind result in a permanent increase in travel a national trunk line highway system is one of the first requisites.

MEETINGS

Calendar of Coming Meetings

Dec. 8-10—Southern Commercial Congress—Eleventh annual convention, Savannah, Ga. Director General, Southern Building, Washington, D. C.

Dec. 8-11.—American Association of State Highway Officials. —Annual meeting, Louisville, Ky. Chairman, Geo. P. Coleman, State Highway Commissioner of Virginia, Richmond, Va.

Jan. 15-16, 1920—Southern Appalachian Good Roads Association—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Feb. 9-13, 1920—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Apr. 12-17, 1920—United States Good Roads Association. —Eighth Anual Convention, Hot Springs, Ark. Director General J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Apr. 16-17, 1920—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

American Association of State Highway Officials

The following matters have been recommended as deserving attention in papers to be presented by The Associated General Contractors at the coming meeting of the American Association of State Highway Officials:

1. The necessity for an increase in the size of highway contracts;
2. Consideration as to whether grading and paving should be let in the same or in separate contracts;
3. The effect of the shortage of open-top cars on highway work in 1919;
4. The need of utilization of local supplies of aggregate that can be delivered direct to the job by motor truck or industrial railway, as a means of reducing cost and of relieving the probable car shortage of 1920;
5. The use of dry mixtures in concrete pavement construction and its effect on the contractor's work;
6. The needless refinement of some specifications for hard-surface pavements;
7. The value of utilizing the cost-plus-fixed fee, with adjustments, form of contract on highway work;
8. The elimination of unreliable and incompetent contractors from consideration in awarding contracts;
9. Letting contracts in the fall so that all arrangements may be made for an early start of work in the spring, and a reserve supply of aggregates accumulated during the winter;
10. Provision for safeguarding the contractor against unnecessary risks, as for example, the assumption by the state of increased costs due to an advance in freight rates.

The Motor Truck Association of America has announced a lecture, illustrated by motion pictures, on the truck demonstration trip described in "Good Roads" of Nov. 5. The lecture will be given at Reisenwebers, 8th Ave. and 58th St., New York, N. Y., at 8 p. m., Thursday, Nov. 20. The lecture will be preceded by an informal, a la carte dinner at 6:30.

At a meeting of the board of directors of the South Carolina Automotive Trade Association at Raleigh, N. C., early this month resolutions were adopted strongly urging the passage at the next session of the Legislature of a measure providing for the construction of permanent highways in the state. The resolutions also pledged the association's support of such measure. The officers of the organization, which has its headquarters at Columbia, are: President, A. Mason Gibbes, and Secretary, Harold C. Booker, both of Columbia.

PERSONAL MENTION

H. H. Dunlap, of Barstow, Ward County, Texas, has been appointed engineer for Ector and Crane Counties, Texas.

Arthur Bladholm has been appointed highway engineer of Lyon County, Minnesota, succeeding D. W. Webster, resigned.

George R. Nerman, of Arnot, Pa., has been appointed superintendent of state highways in Tioga County, Pennsylvania, succeeding W. H. Hatfield, resigned.

J. H. Brewster, formerly with the Engineering Department of the New York State Board of Health, is at the head of the health, sewage disposal, water and milk sections of the International Exposition of Municipal Equipment, Grand Central Palace, New York.

E. J. Dewine, formerly with the Southern Contracting Co., the road department of the Barrett Company and the U. S. Asphalt Refining Company, is in charge of the department of streets, asphalt and road machinery of the International Exposition of Municipal Equipment, Grand Central Palace, New York.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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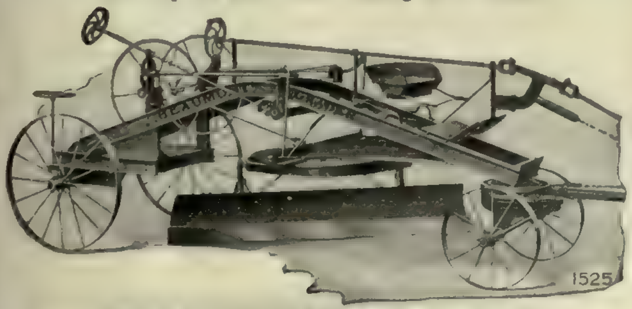
*Illustrated Article

Beaumont Road Building Machinery
THE BEAUMONT GRADER
The Only All Steel Roller Bearing Road Machine



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Three views of the oyster-shell roads in Galveston, Texas, surface-treated in 1917 with "Tarvia-B" and "A." At top are shown 35th Street and Broadway. Lower view shows 20th Street, in the business section of the city.

Galveston's oyster-shell streets successfully surfaced with Tarvia

WE have repeatedly claimed that there is a grade of Tarvia and a method of application that will solve practically any road problem—and solve it economically.

Now comes a letter from George H. Willits, City Engineer of Galveston, Texas, telling how Tarvia improved that city's oyster-shell streets, and at the same time reduced maintenance expense. A portion of Mr. Willits' letter follows:

"Practically *all* of Galveston's streets, outside of the business district, are built of rotted oyster shell, commonly called mudshell. This shell is easily compacted into a smooth, hard road surface which looks very much like concrete. However, this surface will not withstand wet weather nor the abrasion of heavy traffic, becoming very dusty in summer and on account of its white color, causing a disagreeable glare, and in the rainy season soon becoming muddy and full of holes.

"In May, 1917, we began surface treating these shell streets with 'Tarvia-B' and 'A' and trap rock and have had very fine results from this work. Our streets stay in good surface during all kinds of weather; we have eliminated heavy maintenance bills for shell and do not find it necessary to sprinkle these treated streets as we are compelled to do all untreated shell streets for eight months in the year. The dark color of the Tarvia surface entirely eliminates the disagreeable glare.

"The people of Galveston are very much pleased with the results obtained by surfacing the streets with Tarvia and testify to this by always seeking the treated streets for the heaviest travel."

We believe we may safely say that no matter *what* kind of a road problem you are facing, Tarvia will help you in the solution—and save you money, too.

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Special Service Department

This company has a corps of trained engineers and chemists who have given years of study to modern road problems. The advice of these men may be had for the asking by any one interested. If you will write to the nearest office regarding road problems and conditions in your vicinity, the matter will be given prompt attention.

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVII.
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NEW YORK, NOVEMBER 26, 1919

Number
22

New Joint Spacer for Wood Block Pavements

Description of Methods Employed in the Construction of Wood Block Pavement in the Street Railway Track Area in St. Thomas, Ontario

By JOHN STANLEY CRANDELL*

The track allowance of the St. Thomas Municipal Railway in Talbot Street, St. Thomas, Ontario, is being repaved. The old and worn-out rails had to be renewed, and it was decided that part of the allowance should be paved with wood block on concrete. James A. Bell, consulting municipal engineer, and acting city engineer, drew up plans calling for a concrete base, on which the blocks are laid after the base has been painted with coal tar pitch. In order to insure waterproof joints, and also to take care of any expansion of the wood block, which are of the plain rectangular type, a new device is being used to separate the rows of blocks. This is a corrugated cardboard spacer which is placed between each two rows. The space thus secured is about $\frac{3}{16}$ of an inch in width, or less, if the blocks are slightly rammed. This permits the paving pitch, which is squeegeed over the tops of the blocks, to find its way into every joint and thoroughly waterproof the pavement.

The spacer is cut in strips 250 ft. long and 1¼ in. wide, the corrugations running vertically. Enough paving pitch is introdused into the joints to fill them about half way to the top. The pitch finds its way easily to the bottom of the joints, and flows around the spacer, which acts as a dam to prevent movement of the pitch if the pavement has an excessive crown. Sand is strewn over the top and is broomed into the joints where, in warm weather, it unites with the pitch to form a mastic.

The work of repaving is being done under Mr. Bell's direction and under the immediate supervision of W. C. Miller, assistant engineer.

Corrugated Spacer in Place

Squeegeeing Paving Pitch

VIEWS ILLUSTRATING METHOD OF USING NEW JOINT SPACER IN WOOD BLOCK PAVEMENT CONSTRUCTION
TALBOT STREET, ST. THOMAS. ONTARIO

---

*Consulting Engineer, General Tarvia Department, The Barrett Company.

Road Work in 1919 and 1920

Text of Letter from Chief of Bureau of Public Roads to State Highway Departments Reviewing 1919 Work and Forecasting Work of 1920---Influence of Transportation---Need of Early Awards

By THOMAS H. MacDONALD*

It is a matter in which the state highway departments may take a large measure of satisfaction that road building is the one big public activity which got under way early in 1919, which opened a large field for unemployed labor, which offered a market for construction materials, and which has continued to increase in volume as the months have passed. It is too early to have definite figures available for this year's production of roads and total expenditures, but it is estimated that the expenditures during 1919 for hard surfaced highways, exclusive of sand-clay and similar types, will total approximately $138,000,000. The largest previous year's total expenditures for like purposes, that of 1916, was $136,000,000.

But the test of the road building organizations is ahead. The estimated summary of the funds which will be available for highway work during 1920 for the construction of surfaced highways is as follows:

Brought forward from unfinished work 1919 contracts........	$165,000,000
Funds available from state and county taxes and federal aid	273,000,000
One-fifth state and county bond issues not before available....	50,000,000
One-third of the unexpended balance of state and county bond issues previously available	45,000,000
Available from new bond issues to be voted on the fall of 1919 and spring of 1920.	100,000,000
Total	$633,000,000

This large total is more than four times the amount of money that has been expended during any previous year for like purposes. To accomplish the physical undertaking of putting into actual road construction this sum or anywhere near this sum is tremendous. It is so much greater than any program that has heretofore been attempted that a great increase in the principal factors controlling the actual production of highways is absolutely essential. These principal factors are material supplies, shipping facilities, labor supply and contractors' organization. The acute deficiency of open-top cars demands that our first attention be directed towards increasing shipping facilities for road materials. These facilities may be increased by two methods; first, by the more efficient use of open-top car equipment, and second, by a large increase in the supply of new cars. During frequent conferences with the Railroad Administration it has become apparent that a more efficient use may be made of the present open-top car equipment by starting the shipping season earlier than has been the general practice in the past. It has been customary to wait until contractors' organizations were ready to begin work before starting the shipment of materials. Under these conditions many thousands of open-top cars lie idle during the latter part of February, all of March, and the earlier part of April. In the spring of 1919 the number of open-top cars that were idle totaled more than 250,000. As the season advanced and road contracts were actually under way, the car shortage manifested itself here and there almost continuously, but at three different times complaints received at this office were general.

We must recognize that if a strike threatens the railroads, road material will not be moved, because it is not perishable. If the movement of coal demands the cars, there will be a shortage of cars for the movement of road materials. The importance of the movement of road materials must be impressed upon the public and the railroads, and for the present the road builders must correlate their calls for service so far as possible with the situation which exists—that at any critical moment when shipping facilities are involved, road materials will be the first to suffer.

Therefore, everything possible must be done to facilitate transportation of road materials under these handicaps. Railroad transportation has become too important a factor in the amount of work that can be accomplished to allow it longer to be regarded as incidental. It has become the biggest item in road production. Contracts should be awarded as early as possible that the contractors may know the amount of materials they will require at different points and they should be encouraged to place their orders for the materials requiring rail transportation as long in advance of the time they will be actually required as possible. The placing of materials in storage piles involves some expense, but this expense is small **in comparison to the loss occasioned by lack of materials when the contractor's organization is waiting.**

From the experience this year and in view of the greatly increased program for next year, it seems apparent that contracts which are not awarded during the winter months will have little opportunity of being supplied with materials which **require rail hauling. Again, contracts should be awarded early and contractors should be encouraged to place their orders so that the material producers will operate their plants** during all seasonable weather. In the past, too many contracts have been held until later in the year and material supplies have not been started moving during the period when the car supply is at its maximum. Also, contract prices have usually been lower for work awarded early in the season, and the state departments and the federal bureau must recognize and respond to the public confidence which has been shown by the appropriations of large sums for highway improvement, by adopting every method that will help to secure the lowest prices and the most efficient expenditure **of these funds.**

In view of the greatly enlarged program of road construction and the large amount of unfinished contracts which will have to go over because of lack of road materials, it would seem unnecessary to further accent the need for taking advantage of the supply of open-top car equipment in February, **March and April.**

It is apparent that many contractors who have not before been so engaged are looking to the highway field, and that the contractors' organizations will be expanded. The labor shortage may in part be met by improved machinery and equipment, but the transportation and the supply of materials cannot be so readily or quickly expanded to take care of the greatly increased needs. Unless a forward looking policy recognizing these conditions is adopted at once, it is not apparent that a greatly increased production of roads will be possible next year over the miles constructed this year, yet **the public is demanding of road building organizations a greatly increased production.**

Every official in an administrative capacity in the road building organizations knows that it is common for the public to demand great activity and immediate production of roads as soon as bonds have been voted. The fact that more than four times as much money is available for roads next year than has been true heretofore means that these demands will become intensified and it will be a difficult task to im-

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*Chief, Bureau of Public Roads, U. S. Department of Agriculture.

press upon the public the fact that the production of roads is controlled by factors largely outside of the control of the highway officials.

The only possible relief is to use the present transportation and materials production agencies in the most efficient manner possible, and at the same time bend our efforts to obtain an increased car supply and an increased production of road materials. But these policies, to be effective, must be adopted by the state departments and the federal bureau individually and collectively, at once, and the first step is to place under contract during December and January as great a mileage of roads as possible. In doing this the Bureau wishes to cooperate with and aid the states in every way possible.

* * *

The Future Highways of Vermont*

Present Progress Too Slow---Necessity of Making a Study of The Problem---Kind of System Needed---Types of Roads to be Built---Highway Department Organization---Cost of the Work

By T. W. DIX†

During the past few months we have heard much regarding Vermont's future highways. Because of the peculiar interest which has been generally aroused and because of the universal need of good roads, it is especially fitting that the Vermont Society of Engineers should consider the subject at this time. I have attempted this report, not because I feel competent to treat the subject properly, but in hope that some good discussion will be developed. In my estimation, there is no society and no organization, professional or otherwise, which is more worthy and better qualified to consider Vermont's needs in good roads than the Vermont Society of Engineers.

It would be useless to take time to consider this subject unless there is or will be a desire on the part of the people of Vermont for better highways. I believe there is such a desire; in fact, I am convinced that there is a crying demand from the people for better roads. It would still be folly to spend our time with this subject if the people of Vermont are satisfied with the progress which is now being made. Very much good work has been done in the past, but I share with many others the opinion that our progress is too slow and that some decided changes are needed before our road problems can be successfully dealt with. Any speeding up of our construction program means the raising of additional funds, but I believe the people are ready to supply the money just as soon as they are shown that it will be spent so as to serve all the people to the greatest possible advantage. I am satisfied that we need good roads faster than we are building them, that our construction program must be speeded up, and that it will be speeded up; in other words that we are going to have good roads whether we go out after them or whether they are forced upon us. But in either case we shall have to pay the bill.

The question is then, exactly what do we need and how are we going to get it?

The answer to this question can not be extracted from the head of any person at the present time, for it must be based upon the results of research, investigation, design and estimates which to my knowledge have not yet been made.

Some weeks ago there was published in several of our state papers a report of the Chicago road meeting held on Dec. 9, 10, 11 and 12 last. This report was in letter form and addressed to Governor-Elect Clement and urged that all road improvements in the state should be of the hard-surfaced type. If this report referred merely to a few selected roads of the state we should be glad to agree with it, but as this recommendation was evidently intended for all our roads its feasibility is decidedly questionable. The construction of hard-surfaced roads, except on a part of our main trunk lines which carry the bulk of our traffic, would be undesirable, impracticable and financially impossible. With our large supplies of gravel, gravel roads will continue for a long time to be the most feasible type of construction to employ on a large part of our road mileage. For much of our town road mileage the earth road will for a long time be the only type within the reach of the people.

In common with the plan in many of our progressive states we should have a system of state highways connecting the population centers and county seats one with another, and with the highway systems of adjoining states and Canada. It should also connect with important railroad stations and manufacturing centers not included above. For the purpose of this paper we will define a population center as a village or city having a population of 500 or over. Then such a system as I have in mind would comprise roughly 1,000 mi. of road; it would follow for the most part along the most important red line routes of our state road map, and would be capable of putting about 60% of the people of Vermont on first class roads.

Immediately after the roads of this state highway system have been selected and agreed upon the state should take them over, and maintain them out of state funds until they are rebuilt, and then continue to maintain them out of state funds. The enire cost of building this system should be borne by the state.

The types of construction can be selected only after a very careful examination has been made of materials, prices, etc., but should be of a high standard and of such character as to place no limitations on traffic beyond the limitations imposed by law, of which we shall hear later from another speaker. The culverts and bridges of this system should be brought up to a corresponding standard, and I believe at state expense. Our by-words in the construction of this system should be "permanence and durability."

Such a system would accommodate the bulk of heavy traffic of the state, but would be manifestly inadequate in many respects. To partly overcome these deficiencies a system of county highways would be necessary. This system should connect the small population centers one with the other and with the state highways, should pass through and open our rich agricultural sections and should make accessible our wonderfully beautiful and picturesque mountains and lakes. It would comprise probably some 2,000 to 2,500 mi. of road and would follow for the most part along the remaining red line routes and the most important blue line routes of our road maps, and would be capable of putting some 20 to 25% more of the people of the state on good roads. The construction and maintenance of this system should be under the supervision of the state and the expense should be borne jointly by the state, county and town.

Such parts of the construction as grading, drainage, culverts and bridges should be made permanent, but the best surfacing material for this system would most likely be found in our gravel pits. It might be well to provide somewhat more drastic limitations as to wheel loads for this system than for the state highways, and it might be well to use different limitations of loads for varying conditions of the road.

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*Report of the Committee on Roads and Pavements of the Vermont Society of Engineers; presented at the 1919 meeting. From the "Proceedings" of the Society.

†Assistant Professor of Highway Engineering, University of Vermont.

There would still remain in the outlying and thinly populated sections some 15 to 20% of our total population. It is this portion of the people that it is most difficult to reach with improved roads. Because of the limited traffic over the roads reaching out from the state and county systems to these regions it is neither necessary nor feasible to employ here costly types of construction. The improvement of these roads is strictly a local proposition and should be undertaken by the towns and financed by them. The routes should be determined so as to accommodate the greatest number of people and connect with the more elaborate state and county systems.

Heavy and expensive grading would not be necessary on most of these roads, but they should be well drained and the surface should be a well maintained earth or gravel road.

I believe a large majority of the people of Vermont are now ready for a road building program somewhat similar to the one just outlined, and it is my firm conviction that the increase in value of property within the state as a result of such a program, would more than cover the cost of the roads. And we would have all the other many advantages of good roads as an asset.

The successful administration of such a program could not possibly be obtained, as was recently proposed, through a "state highway department to be governed by a board of three members, of whom one shall be the governor of the state, ex officio, another the state engineer, ex officio, and the third member to be appointed." Inasmuch as the governor appoints the state engineer it would appear that the above commission would be a governor's commission and consequently our highways might be reduced to the worst kind of political manipulation.

Next to water, politics is the greatest enemy of highways. We should remove our state highway department as far as possible from the temptations and pitfalls of political play.

If the plan outlined in this paper is along the proper lines, then before it is submitted to the people a large number of details should be examined and reported upon. This should be done by a competent engineering force, working in cooperation with the state officials, and whose duties should include an examination of our traffic needs, an investigation of materials available, an estimate of cost and methods of financing. I believe this preliminary survey is absolutely essential before a proposition so large can be properly placed before the people.

To any adequate plan for the improvement of highways there can be but one objection, and that is cost. In my opinion, an adequate plan of improvement, bringing benefit to all, would arouse universal approval, while any plan specially designed for the benefit of one particular class would meet with almost universal opposition, even if the latter were to cost only a fraction of the first. If we are to have an adequate system of highways in this state, within the natural lifetime of most of us, it will be necessary to raise part of the funds by means of a bond issue. And for all that work which is permanent I can see no objection to meeting its cost in this manner.

The question confronting us is not whether or not we can afford good roads but whether or not we can afford to be without them.

In conclusion, gentlemen, I believe it would materially aid the good roads movement in this state if this Society would go on record at this meeting in declaring itself in favor of an immediate and adequate good roads program based only on sound engineering and financial principles. And I propose to you, Mr. President, that before this meeting is adjourned, you call for a standing vote of all those who favor such a program.

Costly Road Work in Colorado

Project Statements Filed in Denver Office of the Bureau of Public Roads for Two of the Most Expensive Highways in the State

Road work in Colorado costs more than it does in most other states, according to the officials of the Bureau of Public Roads of the U. S. Department of Agriculture.

Applications for federal aid on two of the most expensive projects ever undertaken in Colorado were recently made at the Denver office of the Bureau. One of them, said to be the most expensive per mile that ever came before the federal officials, is for a road 1.15 mi. long between Ouray and Bear Creek. The estimated cost is $68,432, or more than $50,000 per mile. The other is for a road 2.75 mi. long in Eagle County. It extends from Red Cliff along the Minturn Road and crosses Battle Mountain. The estimated cost is $114,500.

Both roads are described as "heavy mountain" construction and are said by engineers to be two of the most difficult roads to build in the state.

Courses in Highway Engineering and Highway Transport at the University of Michigan

Announcement has recently been made of the periods in which short period graduate courses in highway engineering and highway transport will be given at the University of Michigan during the winter of 1919-20. This work is in charge of Prof. Arthur H. Blanchard, who for several years conducted similar courses at Columbia University, New York City. The schedule follows:

Civil Engineering 67. Highway Transport. Prof. Blanchard Feb. 2 to Feb. 6. Mondays to Fridays, 1:30 to 4:30 p. m. 1 hour credit.

Civil Engineering 68. Bituminous Surfaces and Bituminous Pavements. Prof. Blanchard. Dec. 1 to 19, Mondays to Fridays, 1:30 to 4:30 p. m. 3 hours credit.

Civil Engineering 69. Highway Laboratory Research. Prof. Bateman. Jan. 5 to 23. Mondays to Fridays, 10 a. m. to 12 m. and 1 to 5 p. m. 2 to 3 hours credit, dependent upon a student's previous training in highway laboratory methods.

Civil Engineering 70. Highway Bridges. Prof. Gram. Feb. 9 to 20. Mondays to Fridays, 1:30 to 4:30 p. m. 2 hours credit.

Civil Engineering 71. Specifications and Contracts. Prof. Riggs. Feb. 9 to 20. Mondays to Fridays, 1:30 to 4:30 p. m. 2 hours credit.

Civil Engineering 72. Earth, Gravel and Broken Stone Roads. Prof. Bateman. Mar. 1 to 12. Mondays to Fridays, 1:30 to 4:30 p. m. 2 hours credit.

Civil Engineering 73. Cement-Concrete Pavements. Prof. Blanchard. Mar. 1 to 9. Mondays to Fridays, 1:30 to 4 p. m. 1 hour credit.

Civil Engineering 74. Brick Pavements. Prof. Blanchard. Mar. 11 to 19. Monday to Fridays, 1:30 to 4 p. m. 1 hour credit.

Civil Engineering 75. Highway Engineering Seminar. Prof. Blanchard. Dec. 1 to Mar. 19. 3 hours credit.

Fees: The fees for courses are based on the number of credit hours for each course. The fee for each credit hour is $5.

For further information pertaining to the short period graduate courses, write to Arthur H. Blanchard, Professor of Highway Engineering, University of Michigan, Ann Arbor, Mich.

A $100,000,000 Road Bond Issue in New York State will be urged at the next session of the Legislature by the New York State Motor Federation, according to Secretary George C. Donahue.

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
Editor

T. A. HULBERT
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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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NEXT YEAR'S ROAD WORK

According to figures compiled by the Bureau of Public Roads and reviewed in a letter by Chief MacDonald, which is printed elsewhere in this issue, the available funds for highway work in 1920 will amount to $633,000,000, a sum that, according to Mr. MacDonald, "is more than four times the amount of money that has been expended during any previous year for like purposes."

This is a gratifying outlook, but, as Mr. MacDonald warns, "the test of the road building organizations is ahead." This is so because, again in Mr. MacDonald's words, "It (the total estimated expenditure) is so much greater than any program that has heretofore been attempted that a great increase in the principal factors controlling the actual production of highways is absolutely essential. These principal factors are material supplies, shipping facilities, labor supply and contractors' organizations."

Mr. MacDonald especially emphasizes the second factor—shipping facilities—and points out what can be done to overcome the difficulties of obtaining road materials. As has been pointed out before, the open-top cars required for the transportation of road building materials lie idle in large numbers during the winter months. That period, therefore, offers contractors an excellent opportunity to obtain their supplies and though it would mean some modifications in their usual procedure, it could be accomplished in many cases.

This measure, however, could not be carried out without the active cooperation of the state highway departments in so planning their work that contracts could be awarded during the winter. This matter was touched upon by President Coleman of the American Road Builders' Association in his address at the annual meeting of that organization and was commented upon briefly in this column in the issue of November 12. For many reasons besides facilitating shipping, it would be advantageous for highway departments to do this and it is encouraging to note that arrangements for doing so are being made in a number of the states.

The awarding of contracts for next year's work as soon as possible will do much toward taking care of the two factors of material supplies and shipping facilities. The factor of labor supply may prove more difficult of control. In this connection it is interesting to recall the conclusion of the report of the A. R. B. A. committee on "Sources of Supply of Unskilled Labor for Highway Work," which was noted in the account of the annual meeting of the American Road Builders' Association printed in the issue of Nov. 12.

When this committee submitted a progress report to the annual convention in February of this year, it expressed the belief that there would be a sufficient supply of unskilled labor for highway work during 1919 and that the labor would be secured at wages slightly less than those prevailing in 1918. At the committee's suggestion, it was voted at the annual meeting early this month to amend the conclusion reached last February by a paragraph explaining the causes leading the committee to reach its former conclusion and to add the following paragraph:

"Instead of a plentiful supply of common labor at a less wage than in 1918, as seemed probable last February, there has actually been a shortage of common labor and wages have been higher than ever before. It seems probable that this condition will continue for several seasons."

From this and from the observation of existing conditions and a study of the possibilities of the future, it would appear probable that obtaining labor will be one of the difficulties of next season's work. While it may not be possible to take any very definite steps at this time, it is feasible and advisable to undertake a careful study of the situation in order to prepare for meeting conditions next season. Labor saving machinery, as Mr. MacDonald points out, may be made partly to meet the labor shortage and it is certain that this means can be utilized to a greater extent than it has been utilized in the past.

The factor of contractors' organizations is also one that can be controlled to a large extent by thorough preparation during the months preceding the opening of the road building season. Steps can and should be taken by contractors to build up their organizations to the highest possible point of efficiency. There are many ways in which this can be done, particularly if contracts are awarded early enough so that the contractors can know about what work they are to do during the coming season. As has been pointed out previously, in another connection, the highway departments can cooperate with the contractors in bringing about this condition.

A matter that will be of vital importance to highway officials in next season's work is referred to briefly in the concluding sentences of Mr. MacDonald's letter. That is that the public demands great activity and the production of roads as soon as funds for the work are provided. With an unprecedented amount of money provided for that purpose it is reasonable to expect that this demand will be unusually insistent next year and, as he points out, it will be difficult to impress upon the taxpayers the fact that the produition of roads is governed largely by factors outside of the control of highway officials. Possibly this will not be so hard to do next year as it would under ordinary circumstances, for there is a growing realization of the abnormal conditions obtaining in work of all kinds. Still it is a matter that should be taken into consideration and for which such preparation as is possible should be made.

New Hampshire Goods Roads Association

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Gov. John H. Bartlett of New Harmpshire, Gov. Carl E. Milliken of Maine and Josephus Daniels, Secretary of the United States Navy, are the members of the commission which will have charge of the construction of the Portsmouth-Kittery Bridge, authorized by the Navy Department and the Legislatures of Maine and New Hampshire.

Commander Ernest H. Brownell of the Civil Engineers Corps of the Navy, who is stationed at Portsmouth, L. B. Jones, Chief Engineer of the Maine Bridge Department, and L. B. Grover, of Dover, Division Engineer of the New Hampshire Highway Department, are the engineers who will work out the technical details of the plans, the commission recently announced.

The commission will keep in close touch with the development of the project and the engineers, who are to start to work at once on their preliminary plans, will submit them to the commission as the work progresses.

Highway conditions in the vicinity of Northfield are quite bad, especially the main road to Canterbury Quakers, which is practically impassable in wet weather. Logging and wood teams have practically destroyed whatever road there was. Northfield has 85 mi. of highways to care for, and the road agents have been at work on repairs all season, but at this time many of the roads are still in very bad condition.

The state highway in Tilton and Belmont on the Merrimack Bouplevard has now been completed. This road improvement was badly needed, for in the spring conditions toward East Tilton and Franklin were very bad.

The ninth annual meeting of the New Hampshire assessors will be held in Manchester on Dec. 17 and 18, and it is expected that it will be a banner meeting, as a long list of speakers has been provided that is made up of men thoroughly competent to discuss finance and taxation. On the first evening of the meeting, there will be an open forum when an opportunity will be given to mayors of New Hampshire cities to express their views on taxation problems in connection with their local conditions.

The members of the state tax commission will be present and an opportunity will be afforded the various executives and other persons interested in problems of assessment and taxation to obtain the opinions of the commission on fundamental problems of finance.

A chamber of commerce has been organized in Concord. It is expected that 300 members will be enrolled and a paid secretary will be in charge of the office.

Winter started in with a vengeance on Nov. 6. A snow storm with high winds tied up travel in many parts of the state. There was considerable damage to telephone and telegraph wires and many fine trees were badly injured by the heavy blanket of snow.

The heaviest snowfall reported after this storm was 14 in. in the vicinity of Canaan.

A new state law is now in effect requiring city clerks to collect license fees for automobiles. The new regulations provide that no resident of the state shall be allowed to operate a motor vehicle after Jan. 1, 1920, who has not secured a permit from the local town clerk or the city clerk.

The new law imposes a tax of $1.70 per $100 valuation of the car on new automobiles, such valuation to be the retail selling price of the automobile. If the car is a year old, the tax is $1.20; two years old, $0.90; three years old, $0.50; four years old or more, $0.30. All permits must positively be secured before Jan. 1, 1920, if the owner wishes to operate his car on New Year's Day.

A section of the state highway has recently been opened for travel between Milford and Wilton. This road was closed for repairs early in October and necessitated a detour of 4 mi. which has been a source of great annoyance to automobile drivers and other users of this trunk line. The new surface is of trap rock bituminous macadam 18 ft. wide, and the section completed is 5,500 ft. long.

Commissioner Everett has taken steps to improve the detour necessitated by the construction of the new bridge at South Merrimack on the Keene-Nashua trunk line. Gravel is to be used on the low sections of road that are giving trouble and within a few weeks a temporary bridge will be provided so that travel can use the regular route.

After a jury trial, the superior court has awarded to Hobart A. Goodwin a verdict of $550 against the City of Concord for damages to his automobile on account of an accident caused by a defective culvert on a road at the Plains.

Mayor Moise Verrette has been reelected Mayor of Manchester by a majority of 1,250 votes over his Republican opponent, Andrew B. Bunton.

City Clerk Chamberlain was elected Mayor of Concord with a majority of 826 votes.

Superintendent of Streets Alfred F. Clark, of Concord, has lost his position through the action of Mayor French and the Board of Public Works. A hastily arranged meeting was called and a vote passed declaring the position of superintendent of streets vacant.

The Mayor and Aldermen Blackwood and Lee voted in favor of the change, while Aldermen Brunelle and Davis protested against the action and voted against it. Alderman Brown was absent from the city, and there is a possibility that when he returns the matter will come up for consideration.

The plan of the Mayor is to combine the office of Superintendent of Streets with that of City Engineer, beginning Jan. 1.

Mr. Clark is one of the best known road builders in New Hampshire and was one of the prime movers in the organization of the New Hampshire Road Builders' Association, of which he is now one of the directors.

The state road work near Webster has been finished for the season. About 1 mi. has been resurfaced and the grades have been considerably improved. Some 1,600 ft. of this section have not been rebuilt, but the unfinished sections have been temporarily surfaced with gravel.

At the recent election at Dover, Alvah T. Ramsdell was elected Mayor of the City by the small margin of 52 votes. The vote for street commissioner was as follows: John Worcester received 889 votes; Maurice Layn, 630; Frank Garraghar, 468; Willard, 56; Welch, 54; Moore, 15; Harris 15.

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The supervisors of Ulster County have dropped all opposition to the plan of Commissioner Greene to build concrete roads in that county, and by a unanimous vote the board has approved the construction of the Highland-New Paltz and the Rosendale roads with concrete.

In order to afford a more convenient road to summer homes at Cleverdale and other points on the east shore of Lake George, a state highway is proposed that will extend from the city of Glens Falls to East Lake George, cross to Dunham's Bay, follow the east shore of the lake for several miles to the New York-Montreal Highway in Lake George Village."

At a special term of the Supreme Court held in the city of Troy, Commissioner Greene was directed to accept from Landell & Company, contractors, the sum of 10 ct. to make the full amount of a certified check they should have sent with their low bid for highway work in Erie County, and to award the contract to them. It was shown that a clerical error was made in computing the amount of the check.

The amounts to be assessed by the State Highway Department upon various towns for highway maintenance are as follows: Berne, $950; Bethlehem, $1,550; Coeymans, $850; Colonie, $1,800; Guilderland, $900; Knox, $550; New Scotland, $1,350; Rensselaerville, $300; Westerlo, $900. These amounts are practically the same as last year.

If the proposed $100,000,000 bond issue is approved next year, Commissioner Greene declares that he will prepare plans for the construction of a 14-mi. concrete road, the Breakabeen-Grand Road, which is on the direct route from New York to Oneonta. Nothing can be done this year as the county's share of the state funds has been exhausted.

Unless there is enough money on hand for the construction work to be done on a road, Commissioner Greene says that he will not have the road surveyed. This is a rule which he has made and to which he will adhere strictly.

The following are the awards made at the letting which took place on October 15, by the New York State Highway Commission:

Bluff Point Stone Co.	Clinton County	$ 11,031.50
Antonio Colorusso	Columbia County	249,686.50
Fred W. Knickenburg	Erie County	112,230.35
David J. Phelan & Co.	Essex County	91,154.80
Thos. F. Shaugnessy	Hamilton County	138,090.00
Frank V. Brotsch Co.	Montgomery County	123,928.75
Ward Bros.	Rockland County	20,627.05
Trenor & Knower	Rockland County	29,282.15
Veeder Contg. Co., Inc.	Schenectady County	22,713.50
A. J. Rockwood	Schoharie County	139,725.50
Edgecomb Bros., Inc.	Broome County	79,924.25
D. J. McConville	Franklin County	29,085.70
D. J. Phelan & Co.	Oneida County	61,955.50
W. J. Lawton	Schenectady County	107,566.40

Booth & Flynn, of New York City, were awarded the contract for anchorage shafts for the bridge over Rondout Creek on State Road No. 5599B, for $14,650.00. The other bidders were Paul J. Moranti, Dover, N. Y.; S. B. Van Wagenen, Inc., Rondout, N. Y. and S. J. Harry Co., Shandaken, N. Y.

Just before the expiration of the time limit for filing claims under the Knight Law, more than 300 claims were filed by road contractors to reimburse them for their losses due to war-time increases in the cost of labor, material and transportation. Since the law was enacted, it is estimated that more than 500 such claims for damages, which will aggregate $2,500,000, have been filed. Each claim must be adjudicated by the Court of Claims.

The first case to be tried out under the Knight Law is the claim of the Dale Engineering Company, Utica, N. Y. This case will be tried in either Rochester or Syracuse.

Benjamin P. Wheat, of the firm of Brackett, Todd, Wheat & Wait, the attorney for the New York State Road Builders' Association, was a very busy man the last day for the filing of claims against the state by road contractors.

Charles R. Allen, Jr., consulting engineer, had turned over to him by more than sixty road contractors their data in connection with claims against the state.

Thirteen completion contracts are advertised by the New York State Commission of Highways. Bids are to be received Dec. 9, 1919.

Commissioner of Highways Frederick Stuart Greene, has announced that he has designated 172 roads for construction next year. For the first time, contracts will be awarded during the months of December, January, February, March and April in order that construction work throughout the state may be begun in May. The total number of miles planned is 725.50, of which 527.26 mi. will be constructed of concrete.

There will be four concrete roads built in Albany County—Ravena to the Greene county lines, Altamont to Voorheesville, Callahan Corners to the Becker Corners and Selkirk to Coeymans.

Roads designated for counties adjoining Albany, are as fol-

lows: Schenectady: Pattersonville-Scotch Church; Scotia to the Saratoga County line. Saratoga: Malta-Bemis Heights, part one; Ballston Lake-Crescent, part two; Rexford Flats-Wait Corners Groom Corners; Broadalbin-East Galway. Rensselaer: Defreestville-West Sand Lake; Johnsonville-Buskirk. Greene: Jewett Center-East Ashland; Cairo-Purling. Schoharie: Sharon-Sloansville; Franklinton-Middleburgh; Cobleskill-Sharon Springs, part two; Cherry Valley-Sharon Springs. Montgomery: Fultonville-Amsterdam, part one; Manny Corners-Blue Corners.

Massachusetts Highway Association

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Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston

The regular quarterly meeting of the Massachusetts Highway Association was held at the America House in Boston on Nov. 13. About 200 members were present and among the invited guests were A. W. Dean, Chief Engineer of the Massachusetts Highway Commission; W. Leroy Ulrich, Superintendent of Maintenance, Connecticut Highway Department; Paul D. Sargent, Chief Engineer, State Highway Commission of Maine; F. E. Everett, State Highway Commissioner of New Hampshire; and I. W. Patterson, Chief Engineer, Rhode Island State Highway Board. President Gannon was in the chair.

At the close of the dinner, Michael Driscoll of Brookline was granted permission to address the meeting and he presented the following letter addressed to Governor Coolidge and signed by over fifty members of the Association.

November 13, 1919.

HON. CALVIN COOLIDGE,
Governor of Massachusetts,
Boston, Massachusetts.

Sir:

The undersigned, past presidents and active members of the Massachusetts Highway Association, believe that we represent, among the citizens of the Commonwealth, those who have been most intimate and interested observers of the work of the Massachusetts Highway Commission, from its inception to the present, and who are most thoroughly familiar with what it has accomplished, also what has been done elsewhere; we therefore take the liberty of asking Your Excellency to consider certain important facts.

In 27 years since the organization of the Highway Commission was formed it has had but 10 different members—strong testimony to the soundness of its organization and policies, and there has been no change in its chairman or personnel in seven years. In the past twenty years, as you well know, the system of Massachusetts State Roads, asknowledged to be the finest in the country, has been developed. In the same period the great business of administering the motor vehicle law has been organized.

Despite the fact that it has handled over $35,000,000 in public funds, the honesty, integrity and efficiency of this commission has never been questioned, which record is unique among highway departments in the United States. Its administration has been absolutely clean.

Furthermore, the methods of road construction it has originated and the highway and motor vehicle laws it has formulated have been copied by practically every state in the union.

This commission has always been the leader in the development of new types of highways to meet changes in the character of the traffic and to improve motor transportation, and its specifications have the highest standing wherever roads are built. It was the leader in the introduction of bituminous materials in road construction, it inaugurated the sand-oil road and introduced other road making methods now widely known and employed. The road census, recognized as a most valuable method of forecasting the character of road needs for future travel was first introduced into the United States by the Massachusetts Highway Commission.

In its motor vehicle work the commission has established the standards that have been followed everywhere and in its difficult position which combines legislative, judicial and executive functions, it has been notably free from criticism. It has the distinction of operating the motor vehicle department so economically that almost 90 per cent. of the total of money paid to the State in motor vehicle fees is used directly on the roads.

In matters such as the prevention of reckless driving and the investigation of accidents, in the drafting of a law to prevent dangerous headlight glare; in adopting methods of stopping the theft of motor cars, the commission has been the leader.

In view of these facts, we feel that it would be a serious loss to the State and to those who make and use the highways, which comprehends practically the whole population, if in the organization of the new Department of Public Works all of the present members of the Highway Commission are not retained. Such action on your part will continue existing policies that have proved satisfactory from every point of view, and we believe will meet with the approval and commendation of the citizens of Massachusetts.

WILLIAM J. GANNON, President, Superintendent of Streets, Fitchburg.
C. FRANK ALLEN, Past Pres., 88 Montview Street, West Roxbury.
MICHAEL DRISCOLL, Past Pres., Superintendent of Streets, Brookline.
CHARLES F. KNOWLTON, Past Pres., 57 Wyoming Avenue., Melrose.
GEORGE E. STUART, Past Pres., Street Commissioner, Newton.
FRED H. CLARK, Past Pres., Superintendent of Public Works, Framingham.
JOHN A. WILLIAMS, Past Pres., Irving Street, Framingham.
FRED B. RICHARDSON, Assistant Supt. of Streets Brookline.
DAVID H. LIVINGSTON, Superintendent of Streets, Dedham.
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EDWARD H. HOWE, 20 Wayne Street, Dorchester.
CORNELIUS J. SWEENEY, Superintendent of Public Works, Stoneham.
GEORGE E. AHEARN, Town Engineer, Arlington.
ROBERT H. WHITE, Superintendent of Streets, Lexington.
JOHN J. DRISCOLL, Superintendent of Streets, Maynard.
FRANK B. MANNING, Superintendent of Streets, Fall River.
STEPHEN E. BURKE, Assistant Supt. of Streets, Brookline.
EDWIN H. ROGERS, City Engineer, West Newton.
CHARLES W. STACY, Highway Surveyor, Nahant.
RICHARD J. HAYDEN, 16 Cobden Street, Roxbury.
IRVING E. JOHNSON, Superintendent of Streets, Weymouth.
JAMES W. BLACKMER, Commissioner of Public Works, Beverly.
DANIEL F. VAUGHAN, Highway Surveyer, Stoughton.
H. J. GOODALE, Superintendent of Public Works, Attleboro.
EDWARD W. ROGERS, Superintendent of Streets, Gardner.
JAMES C. BLAKE, Street Commissioner, Worcester.
WILLIAM E. M'CLINTOCK, Past Pres., 27 Crescent Avenue, Chelsea.
CHARLES A. BROWN, Past Pres., 19 Elm Street, Wellesley Hills.
ARTHUR A. ADAMS, Mayor, City of Springfield, Springfield.
WILLIAM F. LEARNED, Past Pres. Town Engineer, Watertown.
JAMES H. SULLIVAN, Past Pres., Superintendent of Streets, Boston.
LOUIS K. ROURKE, Past Pres. 6 Beacon Street, Boston.
JOHN M. KEYES, Past Pres. Chairman of Road Commissioners, Concord.
HENRY V. MACKSEY, Superintendent of Public Works, Woburn.
JOHN F. CLIFFORD, Superintendent of Streets, Hingham.
WILLIAM H. WALSH, Framingham.
T. PARKER CLARKE, Superintendent of Streets, Winchester.
HUGH G. KENNEDY, Street Commissioner, Medford.
FRED E. ELLIS, 186 Upham Street, Melrose.
DANA LIBBEY, Deputy Street Commissioner, Newton.
JAMES A. WATSON, City Hall, Boston.
R. A. JONES Superintendent of Streets, Waltham.
ASA B. PRICHARD, Street Commissioner, Somerville.
ARTHUR H. WOODWARD, Deputy Supt. of Streets, Springfield.
WILLIAM A. BURNETT, Superintendent of Streets, Wellesley.
JAMES O'CONNELL, Superintendent of Streets, Brockton.
GEORGE JASON, Highway Surveyer, Cohasset.
ARCHIE L. MITCHELL, Superintendent of Streets, Norwell.
HENRY D. BLACKMAN, Superintendent of Streets, Needham.
WILLIAM J. OAKES, Highway Surveyor, Natick.
JOSEPH HUCKINS, Superintendent of Streets, Ipswich.
CHARLES S. ROBBINS, Superintendent of Oiling, Worcester.

After reading this letter Mr. Driscoll explained that the letter was not an official communication from the Association and he suggested that it would be appropriate for the members to supplement this action with an official communication expressing the Association's commendation of the administra-

tion of the Massachusetts Highway Commission which has been in the hands of the present members for seven years.

Mr. Driscoll offered the motion, which was seconded by Mr. Macksey, and as a result of a unanimous vote the following letter was delivered at the Governor's office by the committee named for that purpose.

MASSACHUSETTS HIGHWAY ASSOCIATION
BOSTON

November 13, 1919

HON. CALVIN COOLIDGE,
Governor of Massachusetts,
Boston, Massachusetts.
Sir:

The Massachusetts Highway Association at its regular quarterly meeting held in Boston this 13th day of November 1919 fully endorses the accompanying letter addressed to Your Ercellency, signed by Past Presidents and many active members of the Association, urging the retention of the present members of the Massachusetts Highway Commission in the new Department of Public Works about to be organized under the Acts of 1919, Chapter 350, Sections 111-116.

The letter referred to expresses the sentiment of the Massachusetts Highway Association which believes that the honest, faithful and efficient service rendered by these men deserves to be recognized. It also believes that in no better or more appropriate way can this recognition be shown than by retaining the present members of the Massachusetts Highway Commission in the new Department of Public Works.

Adopted by unanimous vote of the Association
(signed) William J. Gannon, President
John M. McCarthy, Secretary

Voted that Messrs.
Michael Driscoll, Brookline
Asa B. Prichard, Somerville
Arthur A. Adams, Springfield
Henry V. Macksey, Woburn
George E. Stuart, Newton
be appointed a committee to present the foregoing to the Governor in person.

(signed) J. M. McCarthy
Secretary.

After this vote, the invited guests from other New England highway departments spoke on the various difficulties encountered during the past year in the administration of their respective departments, and the meeting was then adjourned.

News and Gossip

The town of Mansfield recently took up the question of having a town manager, and a committee composed of Walter H. Lowney, Chairman; William F. McDermott of the Board of Selectmen, and President Richardson of the Mansfield Lumber Company has been appointed to investigate the matter.

At a recent conference, residents of Norwood and Waltham appeared before the committee to explain the benefits that had been derived from this form of administering town affairs.

About fifty laborers have been dropped from the Sewer Department of the City of Lowell on account of lack of funds.

A special town meeting was recently held in Framingham to consider a warrant containing 19 articles and involving the expenditure of $200,000.

An appropriation of $5,500 was made for a power tree-spraying machine.

The sum of $1,500 was voted for land damages in connection with the street improvements on South St.

The question of increasing the pay of employees of the Street Department and to allow them a half-holiday with pay on Saturdays was referred back to the Selectment to report again at the annual March meeting. It was the sense of the meeting that the laborers now receiving $3.50 should receive $4.00 per day.

A contract amounting to $99,034.78 has been awarded to the Bernard E. Grant Contracting Co. for laying a sheet asphalt pavement on Tremont St., Boston, between Dover and Northampton Sts.

There was a hearing granted on the letting of this contract as soon of the abutters and the Team Owners Association objected to the smooth pavement and wanted granite block instead. Judge C. S. Sullivan appeared for the property owners and Secretary Stebbins spoke for the teamsters. The existing granite block pavement has been in place for 25 years and is very rough and badly worn.

The business houses in this section have made every effort to secure granolithic sidewalks to replace the old brick walks but there is no money available now for sidewalk improvements.

Oscar H. Starkweather, at one time Superintendent of Streets of Wakefield, and later employed by the Good Roads Machinery Co. in its Boston office, has deserted the road business and accepted a position with the White Star Laundry Co. in Brockton.

The union of Park and Recreation Department laborers and the Gardeners' and Laborers' Union, A. F. of L., have voted to demand a $5.00 per day rate for all laborers who are members of these unions and a general increase for other classes of employees.

Councillor Hagen has expressed himself as being in favor of this increase. It was reported at a meeting of the union that the employees of the Boston Zoo and the Aquarium had been granted a 5½-day week.

Mayor Peters of Boston has approved the award of two important city paving contracts to the James Doherty Co.

On Federal St there will be wood block and recut granite block, the cost to be $20,972. The other contract is for all wood block on Beacon St. between Massachusetts Ave. and Raleigh St., to cost $43,055.30. Both jobs are to be finished before December 1 of this year.

The City Council of Malden has passed a resolution allowing city laborers an increase of $1.00 per day, bringing the rate to $4.50.

Daniel F. Cronin, Superintendent of Parks and Playgrounds in Boston, met with a serious and unusual accident a few days ago. He was opening a can of chloride of lime when a considerable quantity of the material was thrown in his face, and for a time it was feared he would lose his eyesight. Specialists were called in, and Mr. Cronin has now sufficiently recovered to be assured that his sight will not be impaired.

The Board of Selectmen of the Town of Stoneham has passed a vote increasing the town laborers' pay from $3.50 to $4.00 per day. One thousand dollars will be taken from the reserve fund to cover the cost of this increase during the first year.

ooo

Lincoln County, Missouri, returns show that the people of the county have authorized an $800,000 bond issue, to be expended in building hard roads through the country. The above amount is to be increased by $180,000 from state and federal funds on two highways recently approved by the State Highway Department. To the unanimous consent of every township to share the funds according to its assessed valuation is accredited the popularity of the bond issue.

MEETINGS

Calendar of Coming Meetings

Dec. 8-10—Southern Commercial Congress—Eleventh annual convention, Savannah, Ga. Director General, Southern Building, Washington, D. C.

Dec. 8-11.—American Association of State Highway Officials.—Annual meeting, Louisville, Ky. Chairman, Geo. P. Coleman, State Highway Commissioner of Virginia, Richmond, Va.

Jan. 15-16, 1920—Southern Appalachian Good Roads Association—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Feb. 9-13, 1920—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Apr. 12-17, 1920—United States Good Roads Association.—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Apr. 16-17, 1920—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

PUBLICATIONS

WAYNE COUNTY, MICHIGAN, Board of County Road Commissioners. Thirteenth Annual Report to the Board of Supervisors, for the year ending Sept. 30, 1919. Paper, 6x9 in., 93 pages and covers, illustrated, inset map.

This report follows previous reports of the board, giving details of the operations of the board and a map showing the status of road improvement in the county.

ST. LOUIS, MISSOURI, CITY PLAN COMMISSION. "A Public Building Group Plan for St. Louis." Paper, 8x11 in.; 16 pages and covers; illustrated.

This report embodies a plan for the locating of future public buildings and, according to the letter of transmittal, is offered as a suggestion. Besides a description of the plan prepared by the commission, the report contains several views showing existing and proposed buildings and their grouping.

OKLAHOMA SOCIETY OF ENGINEERS. Transactions; Vol. V, 1919. Paper, 6x9 in.; 48 pages and covers; illustrated. Published by the Oklahoma Society of Engineers, Oklahoma City, Okla. $1.00

Included in this volume of the "Transaction" are lists of officers and members, the constitution of the society, a list of county engineers in Oklahoma, a report of the meeting of the organization held on March 6, 1919, notes on the activities of the society and memoranda on legislation affecting engineers.

RURAL MOTOR EXPRESS AND HIGHWAY TRANSPORT ENGINEERING. Papers presented at the annual meeting of the National Highway Traffic Association, held at New York, N. Y., May 14, 1919. Paper 6x9 in., 20 pages including covers. Published by the National Automobile Chamber of Commerce, Inc., 7 East 42d St., New York, N. Y.

The papers contained in this booklet include the following: "Development of Rural Motor Express Throughout the United States," by F. W. Fenn, Secretary, Motor Truck Committee, National Automobile Chamber of Commerce; "Transportation Surveys for Rural Motor Express Routes," by J. H. Collins, Member, Highways Transport Committee, Council of National Defense, and Investigator of Market Surveys, United States Department of Agriculture; "Wanted: Rural Motor Express in the State of New York," by James E. Boyle, Extension Professor of Rural Economy, College of Agriculture, Cornell University; "Highway Transport Engineering," by Arthur H. Blanchard, President of the National Highway Traffic Association, and "Highway Requirements for Twentieth Century Transportation," by W. G. Thompson, State Highway Engineer of New Jersey.

REYNOLDS AFTER-WAR ATLAS. Cloth 10½x15 in.; 364 pages. Reynolds Printing Co., 416 West 13th., New York, N. Y. $4.50.

This atlas contains 251 maps showing boundaries established by various peace treaties, special maps showing the automobile roads in America, a gazetteer of cities and towns of the world and a gazetteer of American railroads. There are also several special sections, among which are the following: A chapter entitled, "Physical and Commercial Analysis of the World"; a similar section on the United States; a history of the World War, and an outline of the automobile laws of the several states.

OHIO STATE HIGHWAY DEPARTMENT, "Maintenance & Repair of Highways." Prepared by A. H. Hinkle, Deputy Highway Commissioner, Bureau Maintenance and Repair. Paper 5¼x7½ in. 238 pages and covers, illustrated.

This is a brief treatise on maintenance and repair of highways and gives a description of some of the methods considered best practice in this kind of work. The instructions are especially intended for rural highways. It is profusely illustrated, showing views of different equipment in operation, devices for repairing roaEds, and also contains diagrams and tables together with notes and practical suggestions in many cases. There is also a chapter devoted to definitions of terms used in highway work.

PERSONAL MENTION

U. Stephens, formerly assistant city engineer of Waco, Texas, has been appointed city engineer, succeeding George A. Byars.

W. A. Obenchain has resigned as a division engineer of the Texas State Highway Department to accept a position with the Healy Construction Company at Dallas, Texas.

W. C. Young, formerly a constructing engineer in the Goose Creek oil fields, has been appointed county engineer of Polk County, Texas, succeeding A. P. Rollins resigned.

John F. Buckner, who has been city engineer of Cleburne, Texas, for many years, has resigned to become secretary of the Rusk County Highway Commission at Henderson, Texas.

J. A. Block, a division engineer of the Texas State Highway Department, who was stationed at Corpus Christi, has been transferred to Ft. Worth, succeeding W. A. Obenchain, resigned.

D. W. Webster, for several years highway engineer of Lyon County, Minnesota, has resigned to become a division engineer in the State Highway Department of that state. He will have charge of the Northwestern Division.

Cedric B. Smith has been appointed editor of "The Monad," the official organ of the American Association of Engineers. Mr. Smith during the war served as an officer with the 74th Artillery, A. E. F., in France. He is a graduate of both arts and civil engineering from the University of Minnesota, and his experience has been with the Oregon Trunk Ry., the Great Northern Ry., the Chicago Great Western R. R. and the Pennsylvania Lines west of Pittsburgh.

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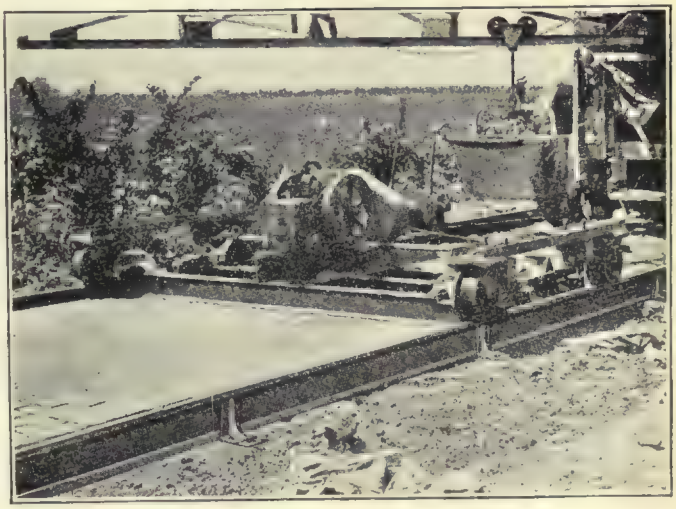

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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVII.
New Series, Vol. XVIII

NEW YORK, DECEMBER 3, 1919

Number
23

Some Highways in Honduras

Early Trails and Methods of Transportation—The Beginning of Road Making—The Carretera del Sur—The New Road from Tegucigalpa, the Capital, to Comayagua—Other New Highways

By EDWARD PERRY

The pathless wilderness is a myth. When man first dared drop from a tree and scurry a little way along the ground, he followed a path already made, mayhap where some giant reptile had dragged his bulk, or a mighty behemoth had crushed tangled vine and bush.

Man learned that from the mountainside he could see farther, cross streams more safely and easily, and avoid difficulties and dangers more surely, than he could on level lowlands where streams ran slow, wide and deep. So he used the high roads until they were worn comparatively smooth, wide and easy.

Men, women and children toted things along these highways. The exercise gave strength and endurance and developed the habit of climbing. So folk who dwelt in hilly Honduras came to see little reason for going around a hill merely because the grade around might be level. They had ample time, no cause for hurry, and legs sturdy enough. So why not go straight up and over? Why leave the ways that were good enough for their forebears from the day they quit their money-shines and living in tree-tops?

Most rural roads of Central America, including "herraduras" so wide that animals carrying loads could pass along them, seem to have been made that way—as if the engineer who first laid out their lines was an ass.

A day came when Spain wanted a direct way to the Pacific shores of the New World, to the Phillipines and to far Cathay beyond. So an ancient trail from Bahia de Caballos—Bay of Horses—on the Caribbean shore of Honduras, due south beside the valley of the Humuya River, to Pacific waters in the Gulf of Fonseca, became a main traveled road.

Many rode over it on their way to find fortune in the lands between the Golden Gate and the Empire of the Incas. Many who had found fortunes there rode back over it to buy delights in old Spain. They wanted a rest on the way across to Honduras, maybe because the road was as described three hundred and thirty years ago by one Valverde, commissioned by the Spanish Crown to study and report upon it. He wrote, in August, 1590, as follows:

"By the lower road to the 'rancho' (hut or cabin) at Chamelecon there are four leagues of ground of very bad quality, wet and swampy, so that in summer it has villianous passes. This road could be opened so that it would be improved somewhat, but not so that it would not be a ruin in winter, and not good in summer."

VIEW ON THE CARRETERA DEL SUR—CART ROAD OF THE SOUTH—REPUBLIC OF HONDURAS

BRIDGE ON HIGHWAY LEADING OUT OF OF TEGUCIGALPA, BUILT IN 1824 AND LATER REBUILT

THE PUERTE LOARQUE, A NEW BRIDGE ON THE CARRETERA DEL SUR NEAR TEGUCIGALPA, HONDURAS

Much of the rest of the seventy leagues of the road was described as rocky, or muddy, or requiring bridges. The commissioner calculated that 100,000 cargoes passed across from one port to the other, a cargo weighing 250 lb. He estimated that 14,000 mules for carrying cargoes alone, with 2,000 more to be resting and for the saddle, would be necessary.

A resting place was wanted for man and beast that traversed the continent here, so with all due ceremonies the city of Santa Maria de Comayagua was founded. It is about one-third of the distance from the Caribbean to the Pacific, and 1,690 ft. above sea level, always swept and cooled by the northeast trade wind.

They who lived even a few miles from the highway had little to sell and could buy even less; therefore had small need for good roads. Yet where hamlets or villages were not too far apart there was passing to and fro, enough to wear trails so much that they were easily widened into "caminos herraduras."

In time these mule roads became so smooth and broad that carts could be hauled a few miles, or furlongs at least; in some instances even so far as the next town without too great straining of yoke and tongue, creaking of cart body and shrieking of axle and wooden hub, and the "carretera"—the wagon road—came into being.

SWITCHBACK ON A HONDURAN HIGHWAY IN THE MOUNTAINS NEAR THE SAN JUANCITO MINES

About thirty years ago, when the road movement in the United States was scarcely more than started, the national government of the Republic of Honduras began the making of an improved wagon road from Tegucigalpa southward to the waters of the Pacific. The same administration began a wagon road that was to extend from Tegucigalpa via Comayagua to the southern end of the one railroad the republic then had. It then ran from San Pedro Sula 38 mi. north to the Caribbean. These roads were made under a contract with Captain Frank Imboden, a Virginian; but the one designed to reach the railroad and thus give an interoceanic road was not completed and, therefore, was used but little.

The road amid the mountains to the south was used, although its grades and curves were less easy than were afforded by lines adopted later. That road served more than 100,-000 people dwelling in departmentos on or near it, and the largest and most productive group of silver mines in the republic, if not in all Central America.

TEGUCIGALPA—AMAPALA ROAD UNDER CONSTRUCTION

Honduras persisted in such road improvement whenever it was practicable, until, at the end of July, 1915, of the 81 mi. of this "Carretera del Sur"—Cart road of the South—62.6 mi. were macadamized, and the rest were easily passable at most times. Many of its curves and grades had been improved, and a number of bridges of superior solidity, durability and beauty had been built. The bridge built in 1824 to afford to Tegucigalpa an outlet to the sousħ and west, served through eighty years and more. Then a big flood piled trees and other materials against it and the dammed waters tore at the bases of the piers, at last carrying down two or three arches. The bridge was rebuilt and is stronger than ever.

Besides this excellent highway, Honduras was building another to reach Juticalpa, the capital of the Departmento of Olancho. It was to be about 118 mi. long and to connect with the railroad under construction from Trujillo on the Caribbean shore.

About the first of May, 1918, automobiles carried Mrs. H. T. Ewing, wife of the American Minister, their daughter, Marguerite, and a British vice-consul in a few hours from Tegucigalpa 38.5 mi. on the way to Comayagua.

In its issue of July 10, 1919, "El Nuevo Tiempo," of Tegucigalpa, printed an item to the effect that:

"It is said that next Monday will begin the construction of

(Concluded on Page 242)

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
Editor

T. A. HULBERT
Managing Editor

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIII DECEMBER. 3, 1919 No. 23

INVESTIGATING FUTURE TRAFFIC POSSIBILITIES

An investigation that promises worth while results has been undertaken by the New Jersey State Association of County Engineers, as is noted elsewhere in this issue.

It is axiomatic, of course, that successful road building demands careful studies of traffic, and that such studies should cover the possibilities of the future as well as the actualities of the present. While investigations of these factors are generally undertaken, they are not always as complete as they might well be and the methods of conducting them have not been sufficiently standardized to make the results obtained in given cases of great value to road builders generally.

This latter point is covered in the first question on the blank sent out by the New Jersey association. At present the terms "light traffic" and "heavy traffic" are used very loosely. In some traffic records, for instance, pleasure or passenger traffic is described as "light" traffic while commercial vehicles are grouped as "heavy." Since the purpose of a traffic census is generally the securing of data for use in road building, it should be obvious that the classification of vehicles should be made with respect to their effects upon the road surface, and it is evident that a heavy passenger automobile traveling at high speed may be more destructive of the road than is a light commercial vehicle driven at a comparatively low speed.

While the selection of a road surface must be made with due regard to the amount and kind of traffic the road is to carry, there are other details of design that will also be governed very largely by the traffic. One of these is width. And this is particularly important in view of the fact that funds for road work are by no means sufficient for all there is to be done. The usefulness of a road is often curtailed by insufficient width, while on the other hand, every inch of unnecessary width means a reduction in the mileage that can be built with the available funds.

Another important point covered by the questionnaire is that of the probable increase in motor-driven traffic. While the answers to the questions asked necessarily will be expressions of opinion, they should be of very real value.

MOTOR TRUCKS IN DAIRYING

Several instances of the use of motor trucks for hauling milk have been noted in previous issues and in this a prominent dairyman is quoted as saying that "the wonderful expansion" of the dairy industry is due, in large measure, to the use of trucks by the dairyman, who, he says further, considers the motor truck "an integral part" of his equipment.

The collection of milk comes so little under the observation of the average town dweller that the magnitude of the work is very little realized, although it is of such vital importance. But to those familiar with the methods followed in gathering milk for shipment to large centers of population it is not surprising that the dairyman has turned to the truck for a solution of his transportation problems.

The shipment of milk demands both quick and dependable carriers, for the product is not only perishable but its delivery is essential. In many cases it is carried several hundreds of miles before it gets to the consumer and every possible saving in time must be made. And failure of delivery is a very serious matter.

The motor truck has not only met these conditions, but but has done so economically. According to the dairyman previously quoted, it enables the milk producer to cover twice the distance be could with horse-drawn vehicles and has more than doubled the area from which milk can be collected.

GOOD ROADS AND PROGRESS

The article on roads in Honduras, which is printed on other pages of this issue, illustrates very clearly what good roads mean to a country and—conversely—what are the results of a lack of roads.

Retarded national development is naturally the result of many causes, material and otherwise, and it would not be right to ascribe the backwardness of Honduras or any other Central or South American country to the prevailing want of improved highways. But it is quite safe to assume that conditions in the southern half of this hemisphere would be vastly different if there were more and better roads. If proof of this contention is desired, it is necessary only to compare those sections of our own country where the road systems have been improved with other similar sections where little or nothing has been done toward the betterment of the highways.

Progress of all kinds is largely dependent upon ease of communication between different communities and between the people in the same community; and highways, the primary avenues of travel and traffic, are becoming more and more important links between the people of different sections. Roads not only open up new territory and promote material progress, but also promote mental and moral development. Better roads bring better homes, better schools and better churches. They bring the dwellers in rural communities many of the best of the things that make urban life attractive and without the sacrifice of any of the advantages of country life.

These considerations, perhaps especially those pertaining to industrial and commercial progress, are being realized in many of those countries where road improvement has been given the least attention and a start is being made in many countries where little or nothing has been done heretofore. In the not distant future we may expect to see interesting developments.

Massachusetts Road Officials Appointed

In accordance with the terms of the law passed at the last session of the Massachusetts Legislature, Governor Calvin Coolidge has appointed the officials of the new Public Works Department which succeeds to the State Highway Commission's authority over state road work.

Governor Coolidge has appointed John N. Cole chairman. Mr. Cole was formerly chairman of the Waterways and Public Lands Commission. Frank D. Kemp, of Springfield, and James W. Synan, of Pittsfield, were appointed associate commissioners by the Governor. Both have been members of the Highway Commission for some time, Mr. Kemp since 1909 and Mr. Synan since 1912.

The salary of the chairman of the new department is $7,500 and the associate commissioners receive $6,000 each.

County Engineers of New Jersey Making Traffic Study

Questionnaire Sent Out by Committee of State Association of County Engineers to Collect Data on the Probable Future Traffic on State and County Highways.

The New Jersey State Association of County Engineers has undertaken an investigation of the question of probable future traffic on state and county roads. The work is being carried on by the Committee on Present and Future Traffic Conditions, consisting of the following county engineers: J. L. Bauer, Elizabeth, Chairman; A. H. Nelson, Atlantic City, Secretary; J. J. Albertson, Camden; T. J. Wasser, Jersey City; J. M. Abbot, Toms River; F. A. Reimer, Newark; H. F. Harris, Trenton. As a part of its study of the problem, the committee has sent out the following questionnaire:

(1) For the purpose of road classification and an understanding of the terms "heavy" and "light" traffic, an answer to the following questions is desired:

(a) Should traffic be defined as "heavy" or "light," or should it be defined as "commercial" and "pleasure" traffic?

(b) Should such classification be based on maximum traffic or on average traffic?

(c) What should be the limitations of traffic under these headings?

(2) Have you any dependable traffic records? If so, we would like to secure copies, with full statements as to units used and when and where they were taken. It would also be desirable to know whether they cover all of your roads or the heavy traffic roads only. Is auto truck traffic increasing faster than other auto traffic?

(3) What are the present widths of your roads generally?

(a) Of the paved portions of the roadways?

(b) Of the spaces from gutter to gutter?

(c) Of the entire roadway between property lines?

(4) Are any of your roads at present practically up to their limits of traffic or over-crowded?

If so, give width of pavement and amount of traffic, if possible.

(5) What, in your opinion, will be the increase in automobile traffic in the next ten years?

(a) Will the yearly increase be greater than, equal to, or less than the increase in the past?

(b) Will truck traffic increase faster than other automobile traffic?

(c) Will total loadings tend to increase?

(6) Road traffic statistics taken in some sections indicate that traffic has doubled in the past in periods of from two to three years. If the traffic on your roads six years from the present date is four times as great as it is at present, could it be accommodated by the present roads?

(7) Have you any suggestions to make as to what can be done at this time to provide for future traffic, and as to the following points:

(a) Eliminations of railroad grade crossings?

(b) Paving roads to greater widths than at present or for full widths between gutters?

(c) Planning for securing additional right of way widths for the purpose of ultimately widening present roads so that future traffic may be separated into one-way streams?

(d) Planning of parallel roads on main routes so as to provide for one-way traffic roads, or for the purpose of dividing "commercial" and "pleasure" traffic?

(e) Any other considerations that may suggest themselves to you?

To Use Open-Top Cars in Slack Season

Division of Highways of Illinois Department of Public Works and Buildings Issues Statement to Contractors Explaining Plan

The Division of Highways of the Illinois Department of Public Works and Buildings is planning to take advantage of the ample supply of open-top cars available during the period between March and July An open letter to all contractors explaining the plan of the department has been sent out by S. E. Bradt, Superintendent of Highways. The letter follows:

"To All Contractors:

"It is generally known that the shortage of open top cars during the latter half of the 1919 season has proven to be a very serious handicap to contractors. The reports of the Railroad Administration show that from March until July there is a very large supply of idle cars.

"In addition to the large mileage of uncompleted contracts to be carried over into next season, we hope, if conditions will permt, to award additional contracts for approximately 1,000 mi. of roads. To supply the necessary material for this program will mean a very severe tax upon the material producers unless we are able to extend the construction season. In order to bring this about and thus assist in relieving the open-top car situation as well as a possible shortage of materials, the Department has decided to pay for such materials as sand, gravel and stone, as delivered, without waiting for the same to be incorporated into the work. Vouchers will be issued direct to the railroad company for the freight and to the sand, gravel and stone producers for these materials. The same will be charged against the contractor and the amount thus paid by the Department will go to reduce estimates due the contractor as such materials are used.

"This arrangement will apply not only to contracts now uncompleted, but also to the contracts to be awarded in 1920. In order to make this effective on existing contracts, a supplemental agreement will be made by the Department with the contractor and the surety company. This supplemental agreement will be forwarded to the contractor for his signature with the request that he procure the signature of the surety company at an early date.

"We trust this plan of handling materials will result in the shipment and storage of a large portion of the aggregate during the early part of the season and thus relieve the congestion both as to cars and materials."

"Constructing Pavements by Halves"

Correction in Article in Issue of Oct. 15

An article entitled "Constructing Pavements by Halves," by W. L. Hempelmann, Engineer, Middle Western Division, Asphalt Sales Department, The Texas Company, was printed in "Good Roads" for Oct 15.

Attention is called to a typographical error in the second line of the last paragraph on page 179. As printed, the first part of this line was "important highways will have to be constructed." It should have read: "important highways will have been constructed."

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Concrete Highway to the Extent of 180 Miles on the Cannon Ball trail has been completed in Illinois, according to a recent report, and arrangements are being made for hard surfacing well across Iowa. Missouri also will be asked to provide hard roads for this highway.

HIGHWAY TRANSPORTATION

Motor Trucks in the Dairy Industry

Wonderful Expansion of the Dairy Industry Largly Due to the Motor Truck, According to a Statement Made by a Leading Dairyman

"To the motor truck is due, to a great extent, the wonderful expansion of the dairy industry," according to a statement made by a prominent dairyman at the recent National Dairy Show at Chicago. He added that the truck was regarded by the progressive dairyman as "an integral part of his dairy equipment." Continuing his discussion of the value of the truck, he said:

"The adaptability and economy of the motor truck enable us dairymen to cover twice the distance we formerly did with horse and wagon equipment. It has doubled and trebled the area that composes our source of milk supply. It enables us to transport milk from the farm to the dairy economically and more quickly, and in turn enables us to transport our dairy products from the dairy to shipping points more economically and efficiently. We don't have to depend on the uncertain progress of the horse and wagon. We are not tied down to any definite schedule of the railroads. The motor truck of today is so highly developed that maintaining schedules the year round and overcoming obstacles such as poor roads and inclement weather is considered as a part of the truck's service."

Trucks for Hauling Garbage and Ashes in Cities

Hauling city garbage and ashes by motor truck will result in big savings in time, labor and money, according to Sidney B. Bowman, New York Kissel Distributor.

He says that commissioners of public works in different parts of the country are requesting appropriations in city budgets for the purchase of trucks for this purpose. The speed of the motor truck, its ability to cover area and haul large loads, enable the collector to make more collections and in quicker time than with horse-drawn wagons, thus saving time and effecting large savings to the city governments, as well as benefiting the general public by the quick disposal of garbage.

Shipping Automobile Bodies by Truck

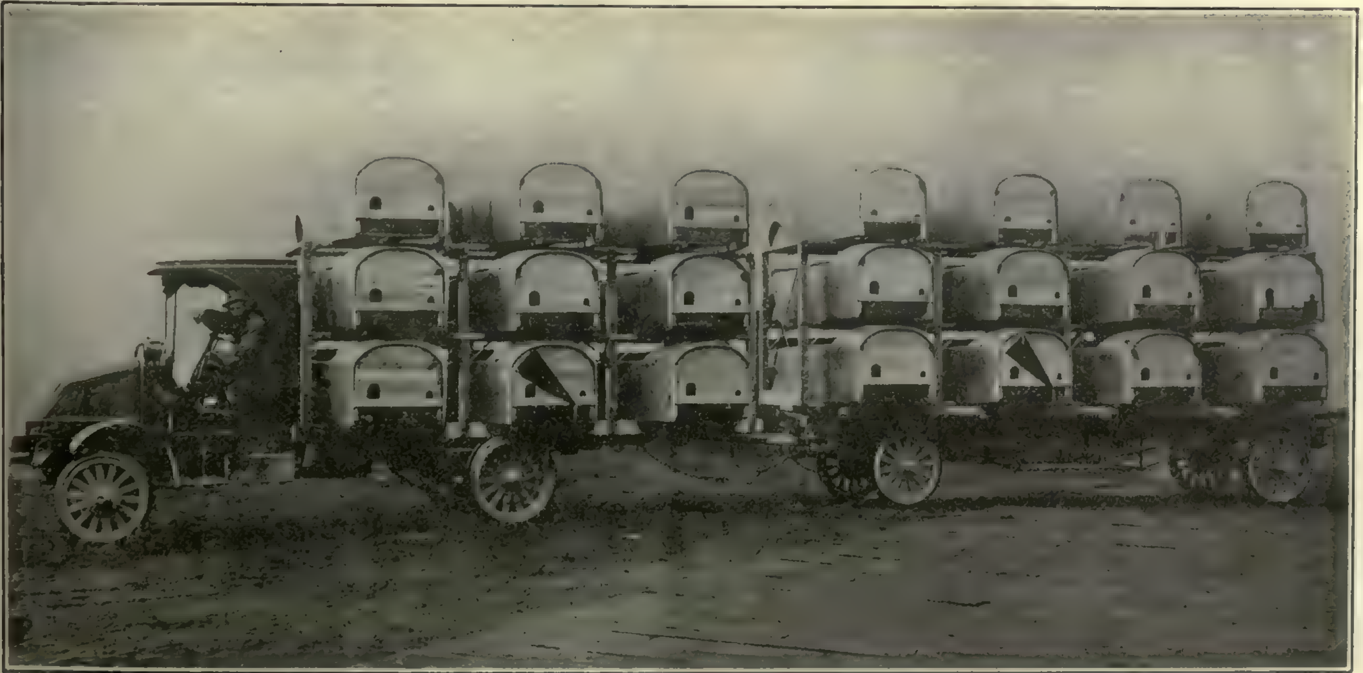
Transfer and Storage Company Uses Truck and Trailer Outfit to Carry Automobile Bodies from Muncie, Indiana to Springfield, Ohio, for Motor Car Manufacturer in Latter City

General trucking concerns are more and more taking the place of railroads in overland transportation with the aid of motor truck and trailer equipment.

The J. S. Wagner Transfer & Storage Co., of Springfield, Ohio, with the aid of a 3-ton Troy trailer with a 22-ft. chassis used in connection with a Kelly truck which has a body equipped with special racks, recently came to the rescue of the Westcott Motor Co., of the same city, when the latter had considerable trouble in getting freight. The Wagner outfit was used to bring 21 of the light six touring car bodies from Muncie, Ind., to Springfield, a distance of approximately 100 mi. The load composed the same number of bodies that can be loaded on a 40-ft. railroad car. The round trip, including loading and unloading time, was made with truck and trailer in 20 hours. By rail, under normal conditions, it would require one week to get the bodies.

According to the Westcott Company's traffic manager, it is a little more expensive to ship the bodies by truck and trailer than by the railroads, but they feel that the extra expense is warranted by the fact that they are not held up on deliveries.

In bad weather the loads are covered with a large canvas envelope which fits closely over the bodies on both truck and trailer. The weight of the bodies averages about 500 lb. each, making the total load for both truck and trailer 10,500 lb.



TROY TRAILER AND KELLY TRUCK LOADED WITH AUTOMOBILE BODIES

Passenger Automobile and Motor Truck Show in New York and Chicago

The annual automobile shows in New York and Chicago will be held Jan. 3-10 and Jan. 24-31, respectively. The New York passenger car show will be held at the Grand Central Palace, while the trucks will be displayed at the 8th Coast Artillery Armory, Jerome Ave. and 184th St.

According to an announcement made recently by Manager Samuel A. Miles, the exhibitions will include 87 different makes of passenger cars, 70 different makes of trucks and 284 accessories. Of the passenger cars, 84 have been entered at both New York and Chicago, while 2 will appear only in Chicago and 1 only in New York. At the New York truck show, 63 different makes will be exhibited.

A series of conferences on highway transportation matters will be a feature of the truck shows.

Your Part

Ten years ago ten thousand trucks
Hauled goods from street to street;
Today five hundred thousand make
The nation's mighty fleet.
Increase at this velocity
In ten short years would mean
Some twenty million motors
In our transportation scheme.

To make this a reality
Is up to you and me
The past has proven that we can,
And figures never lie.
In the words of Teddy Roosevelt,
All men should feel they owe
Some time to their profession,
If they want to see it grow

What part is ours to take and play
In this aggressive game?
It's in your power all the while
To give the truck more fame.
The maker, dealer, salesman, driver,
Owner of a fleet
And everyone that transports goods
Will make success complete.

Reduce costs to a minimum
Don't send out half a load
Enlist the drivers' firm support,
And keep them on the road.
Cry out the slogan, "Ship by Truck,"
Till every person sees
That on hauls long and short
The truck has real economies.

But first and last and always,
These economies depend
Upon good roads, and without them
Development will end.
Do all you can to boost good roads
And then put in your claim
To success that is bound to come
Because you play the game.

P. L. Sniffin
International (Mack) Motor Co.

Pennsylvania Automobile Licenses for 1920

The Registrar of Motor Vehicles for the Pennsylvania State Highway Department has announced that the shipment of license tags for motor vehicles for 1920 will begin on or before Dec. 15, and it is urged that owners make haste in filing their applications for registration.

It is estimated that by January 1, 1920, 200,000 passenger cars, 30,000 commercial cars and 300,000 drivers and operators will have been licensed in Pennsylvania.

The new application blanks are much more complete than those heretofore used, and motorists are advised to procure them as soon as possible in order that no time be lost in filling them out.

The fee charged by the notary for each affidavit required on the application for registration will be 50 ct. instead of 25 ct. as heretofore. This charge is provided for in the Act of Assembly, approved by the Governor on July 10, 1919, wherein all notarial fees are increased.

The 1920 Pennsylvania license tags are blue with white numerals. A hyphen is used to divide the numeral into thousands. The keystone hitherto found on license tags has been done away with. Below the numeral will be found the inscription, "Penna. 1920."

Under the Kansas laws, the changing of the engine number of an automobile is prima facie evidence of dishonesty, and if the number is defaced or tampered with, the driver is liable to prosecution for theft. Section 8, chapter 88 of the Laws of 1919 provides a penalty of from $200 to $500 or imprisonment of 20 to 90 days for the violation of this law.

American motor car manufacturers have obtained a decided hold on the Indian market, according to statistics recently printed in an issue of "Commerce Reports." The total number of cars imported during the month of July was 772, and 750 of these cars, valued at upward of $632,645, came from the United States, the value of the total number of cars being nearly $697,532.

Some Highways in Honduras

(Concluded From Page 238)

the national wagon road from Comayagua to Siguatopequa. We are told that 300 laborers will be employed on this most useful work."

The same issue gave an account of a trip by Maj. A. E. Burke in an automobile from San Pedro Sula to Tegucigalpa. He had been employed by the government to repair parts of existing roads and to make new roads to give a line over which automobiles and motor trucks could carry passengers and freight from the National Railroad to the capital city and to other places on the highway system mentioned. Of his pioneer automobile trip over parts of this route Maj. Burke wrote:

"It was made simply as part of the road work, or an inspection to confirm my opinion that this road could be built this year. The Ford made the run from Potrerillos (terminus of the National Railroad) to Lake Yojoa easily in three hours, over a road having an ascent of 18%.

"Young ladies from Santa Cruz were with us on the trip down the lake, and gave us a banquet, with their best wishes for my success. I may be allowed to add that all along the roads covered by us the people were enthusiastic about the undertaking. They buried our automobile under flowers and all the officials offered their good services.

"Woods were abundant all along the roads, but we carried planks made of 'balsa,' light as cork. We also carried a cable and pulleys to help the Ford climb the mountains, but we had no occasion use them, as the automobile, though small, went up the gradients under its own power, except when willing workmen gave a boost, now and then.

"This trip had difficulties, but proved that the route may be made practicable for passenger automobiles, tractors and trucks, from the National Railroad to the Gulf of Fonseca."

When that shall be done Honduras will have the short and easy iteroceanic highway that, with most praiseworthy determination, she has striven to make through half a century, to take the place of her old and much used "camino real"—royal road—transcontinental traffic over which was killed by the Panama Railroad.

Honduras led the movement for good roads in Central America, and has done an amount of such work that, in view of her financial and economic condition, reflects no little credit upon her people.

MEETINGS

Calendar of Coming Meetings

Dec. 8-10—Southern Commercial Congress—Eleventh annual convention, Savannah, Ga. Director General, Southern Building, Washington, D. C.

Dec. 8-11.—American Association of State Highway Officials.—Annual meeting, Louisville, Ky. Chairman, Geo. P. Coleman, State Highway Commissioner of Virginia, Richmond, Va.

Jan. 15-16, 1920—Southern Appalachian Good Roads Association—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Feb. 9-13, 1920—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Apr. 12-17, 1920—United States Good Roads Association.—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Apr. 16-17, 1920—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

American Association of State Highway Officials

The fifth annual meeting of the American Association of State Highway Officials will be held at the Hotel Seelbach, Louisville, Ky., on Monday, Tuesday, Wednesday and Thursday, Dec. 8, 9, 10 and 11.

The meeting will be opened at 10 a. m. Monday, that session being devoted to the address of welcome, the address of President A. R. Hirst, State Highway Engineer of Wisconsin, and a summary of the highway situation in various parts of the country as follows: In the New England States, by Col. Wm. D. Sohier, of Massachusetts; in the Middle Atlantic States, by Samuel Knopf, of Delaware; in the Southern States, by W. S. Keller, of Alabama; in the Central Western States, by F. R. White, of Iowa; in the Western States, by T. J. Ehrhart, of Colorado; and in the Pacific Coast States, by Herbert Nunn, of Oregon.

There will also be presented a paper on "The General Labor Situation—Suggestions for Its Improvement," by Wm. M. Acheson, of New York.

Technical sessions will be held on Monday afternoon and evening, Tuesday morning and afternoon, Wednesday morning and afternoon and Thursday morning. There will be either an informal dinner or a theater party on Tuesday evening and Wednesday evening will be devoted to committee meetings. The business meeting will be held on Thursday afternoon.

The papers and discussions scheduled are as follows:

Monday Afternoon, December 8

Vice President Paul D. Sargent, of Maine, presiding.

2:30 a. m.—Problems of Administration.

(1) The Necessity of and Suggestions for Proper Cooperation between Adjoining States for the Purpose of Keeping the Cost of Materials and Construction within Fair Limits.
Arthur H. Blanchard, University of Michigan.
Discussion led by C. P. Fortney, of West Virginia, and W. R. Neel, of Georgia.

(2) Highway Administration.
Geo. H. Biles, of Pennsylvania.
Discussion led by C. M. Babcock, of Minnesota, and A. R. Taylor, of Ohio.

(3) A Proposed Scale of Salaries for all Classes of Highway Engineers in Public Service.
A. N. Johnson, Chicago, Chairman of the Committee on Salaries of Engineers in Public Service, American Association of Engineers.
Discussion led by Max Cunningham, of Oklahoma.

(4) What Part of the Total Cost of Highway Construction and Maintenance Should the Motor Vehicle be Expected to Bear?
S. E. Bradt, of Illinois.
Discussion led by M. M. Smith, of Florida, and Frank M. Kerr, of Louisianna.

Monday Evening, December 8

Ira R. Browning, Member of Executive Committee, presiding.

8:00 p. m.—(1) A Better Understanding Between Contractors and Highway Officials.
Representative of the Associated General Contractors of America.

(2) Modern Plant and Equipment for Highway Construction. (Illustrated.)
H. K. Bishop, of Indiana.

(3) States having slides showing new types of road, bridge or culvert construction, or construction or equipment of especial interest, will please bring their slides and show them. This Means Your State. This can be made a very valuable feature if the states will prepare for it.

Tuesday Morning, December 9

Thos. H. MacDonald, of the U. S. Bureau of Public Roads, presiding.

Problems of Design.

9:30 a. m.—(1) Surveys and Plans—How to Be Made, and Suggested Changes to Meet the Shortage of Engineers.
P. St. J. Wilson, Chief Engineer, U. S. Bureau of Public Roads.
Discussion led by Duncan Buie, of Louisiana, and John H. Mullen, of Minnesota.

(2) The Design of Modern Road Surfaces, with Especial Reference to Alignment, Grade, Width and Thickness.
Charles M. Upham, of Delaware.
Discussion led by Frank F. Rogers, of Michigan, James Allen, of Washington, and Frederick S. Greene, of New York.

(3) The Design of Modern Highway Drainage Structures, with Especial Reference to Width, Load Capacities and Ornamentation.
Clifford Older, of Illinois.
Discussion led by Paul Schultze, of New York, and W. F. Cocke, of Virginia.

Tuesday Afternoon, December 9

W. D. Sohier, of Massachusetts, presiding.

2:30 p. m.—(1) Development of Material Supplies for Proposed Heavy Programs; Suggestions Covering a Proper Inspection of Materials.
Austin B. Fletcher, of California.
Discussion led by Watson G. Clark, of New Jersey, and F. E. Everett, of New Hampshire.

(2) Is State Supervision of Construction and Maintenance of all Highways Except City Streets Desirable?
B. H. Piepmeier, of Illinois.
Discussion led by Ira R. Browning, of Utah.

(3) Fair Relations with Contractors. The Influence of Fair Specifications and Competent Inspection on Prices.
H. S. Mattimore, of Pennsylvania.
Discussion led by Paul D. Sargent, of Maine.

Wednesday Morning, December 10

W. S. Keller, of Alabama, presiding.

State and Federal Relations.

9:30 a. m.—(1) Conditions Prevailing as to the Distribution of Federal Supplies and Equipment to the States, Including Progress so far Made and to be Expected—Final Totals to be Distributed.
Col. H. L. Bowlby, of the U. S. Bureau of Public Roads. (Chief, War Materials Division.)
Discussion.

(2) The Handling of Federal Equipment by the States after its Receipt, Organization Methods and Rentals (if any) to Contractors and Force Account Jobs.
Rollen J. Windrow, Texas.
Discussion led by Alex. Graham, of Missouri, and Major R. G. Thomas, of South Carolina.
(3) Relations of the States with the Federal Bureau. Present Conditions as to Cooperation and Suggestions for Betterments.
Geo. P. Coleman, of Virginia.
Discussion led by Stoddard E. Bates, of Vermont, and E. W. James, of the U. S. Bureau of Public Roads.

Wednesday Afternoon, December 10
George P. Coleman, of Virginia, presiding.

2:30 p. m.—(1) Methods of Cooperation between highway departments and railroads to secure proper and adequate transportation of highway materials.
A. G. Gutheim, Car Service Section, U. S. Railroad Administration, Washington, D. C.
Discussion, R. S. Parsons, of New Jersey.
(2) The Present System of Federal Control and Aid for Highways, Its Results, Merits and Limitations. Can it be so Administered and so Modified that It Will Serve the National Purpose?
Thos. H. MacDonald, Chief of the U. S. Bureau.
Discussion.
(3) General Discussion of Federal Aid and Federal Control.

Thursday Morning, December 11
Vice President Paul D. Sargent, of Maine, presiding.
Problems Allied to Highway Work.
(Not over 15 minutes for paper, not over 15 minutes for discussion.)

(1) Marking, Signing and Making Safe a State Highway System.
Levi H. Neilsen, of Michigan.
Discussion.
(2) Contract Bonds—Shall they be Eliminated?
W. G. Thompson, New Jersey.
Discussion.
(3) Making Highways Ornamental as Well as Useful.
John A. Hazlewood, of Madison, Wisconsin.
Discussion.
(4) Maps of Highway Systems of States for Public Use.
M. W. Watson, Kansas.
Discussion.
(5) A National Program of Highway Research.
Dean A. W. Marston, of Ames, Iowa.
Discussion.

County Road Supervisors' Association of Northumberland County, Pa.

More than 200 supervisors of Northumberland County, Pennsylvania, attended the recent 33rd annual session of the County Road Supervisors Association at Sunbury. The Association went on record in favor of good roads on every state highway and declaring against Bolshevism.

Reports from all parts of this big anthracite county were to the effect that two-thirds of the roads are being improved on account of damage done to the roads by heavy trucks, and also that many bridges throughout the county will have to be renewed within the next few years, having been built for wagon duty many years ago.

The act of Assembly by which the bonus system is done away with and a plan substituted whereby the state pays one-third of the upkeep was considered at length and met with the approval of those present.

PERSONAL MENTION

W. A. Miller, formerly with the Bureau of Public Roads, U. S. Department of Agriculture, has been made chief draftsman for the Montana Highway Commission at Helena.

John Ericson, for many years city engineer of Chicago, Ill., has resigned to enter private practice, at the same time accepting an appointment as consulting engineer to the Chicago Department of Public Works.

F. A. Irvine has resigned as city engineer of Jamestown, N. Y., to enter private practice.

E. A. Wood has been appointed resident engineer for the State Highway Department at Haskell, Texas.

Maj. Clinton H. Fisk, U. S. A., formerly chief engineer of construction of the City of St. Louis, Mo., is now vice president of the United States Bank, St. Louis.

Maj. J. F. Carroll, Engineers, U. S. A., recently discharged from service, has resumed his former work as superintendent of construction, Departfent of Public Works, St. Paul, Minn

F. C. Wyse has been elected city engineer of Columbia, S. C., succeeding T. Keith Legare, resigned. Mr. Wyse has been in charge of the Columbia water works system for some time.

J. E. Kirkham, has resigned as professor of structural engineering and chairman of the civil engineering faculty, Iowa State College, to become bridge engineer of the State Highway Commission, of South Dakota.

Maj. Harry D. Williar, of Maryland, an engineer officer in Gen. Pershing's famous First Division, and formerly an engineer on the State Road Commission and later with the Paving Commission of Baltimore, will have charge of the Washington office of the Asphalt Association in the Munsey Building. Washington has been selected as a district headquarters by The Asphalt Association, the main office of the association being in New York. Included in the Washington District are the states of Maryland, Pennsylvania, Delaware, Virginia and West Virginia.

ooo

The City of Toppenish, Wash., has awarded seven contracts, amounting to a total of $112,089.45, to the Standard Asphalt Paving Co. The work will include paving on a number of streets.

The Most Heavily Traveled Road in New York State is the Boston Post Road, extending from New York to the Connecticut state line along Long Island Sound, according to a recent statement based on an official traffic census. The maximum travel recorded on this road in 12 hours was 8,202 vehicles, consisting of 5,614 New York State cars, 1,278 cars from other states, 441 light delivery trucks, 716 heavy trucks, 99 one-horse and 61 two-horse vehicles.

Acting Upon a Request from the Engineering Council to the Director of the Census, the National Service Committee has succeeded in effecting a reclassification of engineers. In future all technical engineers will be listed as such. Non-technical engineers, such as stationary engineers, locomotive drivers and other enginemen, will be grouped under separate headings rather than under one general heading. The next census, therefore, will bring under a single enumeration all technical engineers grouped under the classilcations of civil, mechanical, electrical and mining engineering.

The State Highway Commission of Colorado and the Road Officials of Weld County, Colorado, are spending $30,000 on the Denver-Cheyenne Highway, between Greeley and the town of Evans, but 1 mi. farther south. To the north of Evans the old highway drops into bottom land for a quarter of a mile and then climbs a 5% grade to the level of the city of Greeley. It was never possible to maintain a firm gravel roadbed over this stretch on account of the frequent floods which have come down and washed out the road, making it impassable for days. The 5% grade is being reduced to 2% and the flood danger is being removed by a big diversion ditch and concrete culverts, and 4,700 ft. of concrete paving is being laid on the fills and through the cut at the top of the hill. After the changes are made, what has been the worst stretch of road between Denver and Greeley will be one of the best.

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

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Beaumont Road Building Machinery
THE BEAUMONT GRADER
The Only All Steel Roller Bearing Road Machine

BEAUMONT MFG. CO.
319 ARCH ST., PHILADELPHIA
Builders of Road Building Machinery, Crushers and Graders.
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Cheaper Rock Drilling In Trenches

At Winston-Salem, N. C. — Contractors reduced the cost of drilling rock in a sewer trench 80% by substituting

SULLIVAN ROTATORS

for hand drilling

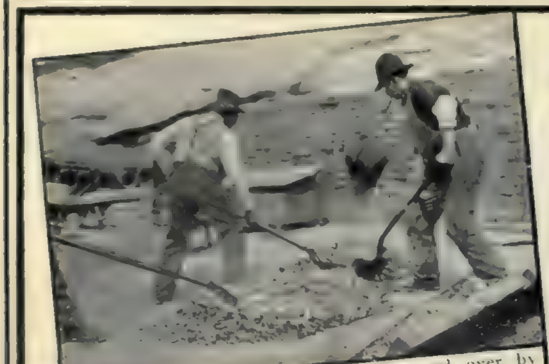
The trench was about three feet wide and the rock cut was 400 feet long, ranging from three to twelve feet in depth. With two Sullivan Steam Tube Rotators, holes three to four feet deep were put in, three to five feet apart. Sixty per cent. dynamite was employed, the holes being filled about two-thirds full and the balance tamped in clay. The rock was hard and broken.

Bulletin 2470-F Describes "Rotators"

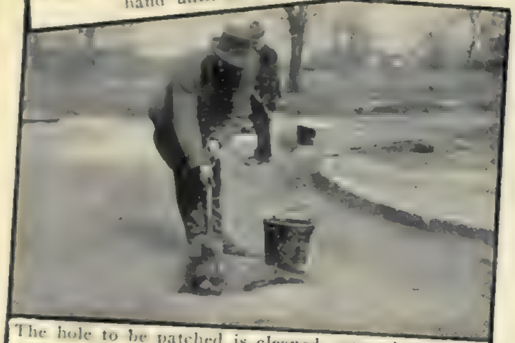
Sullivan Machinery Co.
130 SOUTH MICHIGAN AVENUE, CHICAGO

With common labor at $5.00 a day can you afford to let your men stand idle while the trucks are absent? Lightning Loaders will keep all hands constantly busy. Can you afford to let a truck stand twenty minutes while it is being loaded? A Lightning loader will fill a truck in three minutes.

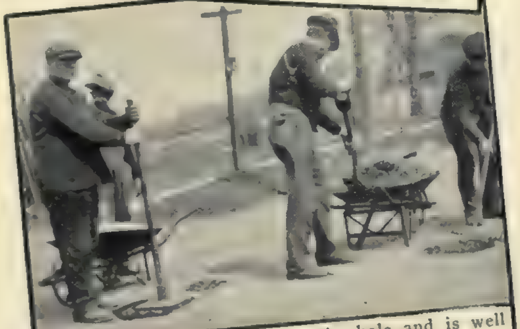
The Heltzel Steel Form & Iron Co.
WARREN, OHIO



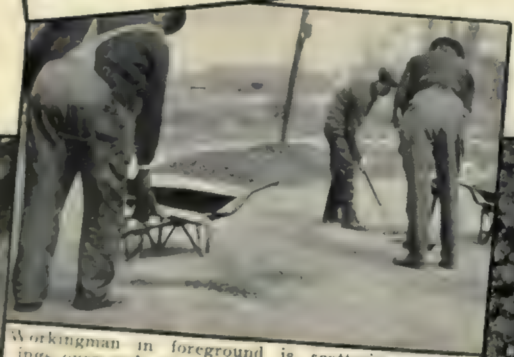
"Tarvia-KP" sand and stone are turned over by hand until all stones are coated



The hole to be patched is cleaned out and the bottom and the sides are painted with "Tarvia-KP"



The mixture is shoveled into the hole and is well tamped



Workingman in foreground is scattering screenings over seal-coat. Then patch is again tamped.

Tarvia-KP

FOR COLD PATCHING

—used now will save dollars later!

"TARVIA-KP" is the highways official's "handyman" for quick, dependable patching work on every type of road.

Used now, it will save many dollars of expensive repair work in the spring. Freezing won't hurt it.

Hundreds of highway officials use Tarvia throughout the winter whenever the roads are free from snow. Thus they fortify their roads against the destruction of winter, and are able to get an early start with their spring surfacing.

The illustrations show how easy it is to use this remarkable **cold** patching material. "Tarvia-KP" is practically fool-proof. Can be stored up in spare moments and used at any time. Order some now.

Interesting booklet showing each step in patching a road with "Tarvia-KP" free upon request. Address nearest office.

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Milwaukee Bangor Washington Johnstown Lebanon Youngstown
Toledo Columbus Richmond Latrobe Bethlehem Elizabeth
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Vancouver St. John, N. B. Halifax, N. S. Sydney, N. S.

Lincoln Highway through Schererville Ind., patched with Tarvia-KP August, 1918, then surface-treated with "Tarvia-B"

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVII.
New Series, Vol. XVIII

NEW YORK, DECEMBER 10, 1919

Number
24

Highway and Bridge Work in Buncombe County, North Carolina

Work under Construction to Cost over $600,000--Cost of Paving and Bridge Work of Past Two Years Over $1,000,000--Best Paved County in the South, According to Asheville Board of Trade Official.

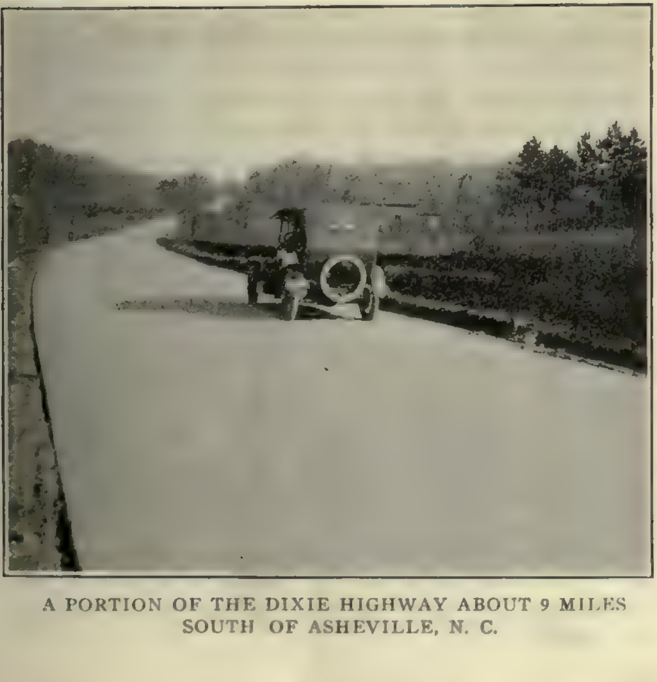
Paving now under construction in Buncombe County, North Carolina, will have cost over $600,000 when completed, according to a report from the Board of Trade of Asheville, the county seat. It is expected that all of this work will be finished before the end of next year.

Buncombe County is situated in the heart of the Blue Ridge, and its citizens claim that it is the best paved county in the South. Besides the expenditure for the work now under way, over $1,000,000 has been spent during the past two years for the building of paved roads and concrete bridges. The City of Asheville has 45 mi. of paved streets and, with the completion of the concrete and asphaltic paving in progress, the county will have additional paved highways with a total length of approximately 85 mi.

The eastern branch of the Dixie Highway crosses the county, a distance of 29 mi. Of this total, 26 mi are paved with asphalt and concrete and the remaining 3 mi. on the west side of the county are of gravel road. The Asheville-Charlotte-Wilmington Highway also crosses the county. A 9-mi. stretch leading easterly from Asheville has recently been paved.

Three of the roads and one of the concrete highway bridges in Buncombe County are shown in the accompanying illustrations. The illustration in the left hand column of this page shows a part of the Dixie Highway 9 mi. south of Asheville. The pavement is cement concrete, 7 in. thick at the center and 5 in. at the sides, 20 ft. in width. At the beginning of the war the cost of constructing this road was about $18,500 a mile. A 12-mi. stretch of similar pavement completed during the last year of the war cost about $25,000 a mile. Sheet asphalt laid over worn-out macadam road has cost about $16,000 a mile.

The illustration in the opposite column shows a curve on the Asheville-Charlotte-Wilmington Highway about 5



A PORTION OF THE DIXIE HIGHWAY ABOUT 9 MILES SOUTH OF ASHEVILLE, N. C.

A CURVE ON THE ASHEVILLE-WILMINGTON - CHARLOTTE HIGHWAY, BUNCOMBE COUNTY, N. C.

CRAGGY RIVER BRIDGE, A CONCRETE HIGHWAY BRIDGE CROSSING THE FRENCH BROAD RIVER ABOUT 5 MILES NORTH OF ASHEVILLE, BUNCOMBE COUNTY, NORTH CAROLINA.

mi. east of Asheville. The pavement is asphaltic concrete laid over worn-out macadam, with a 12-in. cement concrete border on each side. The curves are superelevated, as shown, on the entire 9-mi. stretch.

The upper illustration on this page shows Craggy Bridge, a highway structure crossing French Broad River, 5 mi. north of Asheville. The bridge is 750 ft. long and carries the highway over a railroad track on the far side of the river and five tracks on the near side. The arch spans over the river are each 150 ft. long in the clear. The bridge is 20 ft. wide on top. It cost $62,000 at the prices prevailing during the first year of the war.

The lower illustration shows a stretch of the Dixie Highway at Six-mile Branch, south of Asheville. The pavement is of cement concrete like that shown in the first illustration.

"Good Roads" is indebted for the foregoing data and the photographs from which the illustrations herewith were made to N. Buckner, Secretary of the Board of Trade of Asheville.

VIEW ON THE DIXIE HIGHWAY AT 6-MILE BRANCH, SOUTH OF ASHEVILLE, BUNCOMBE COUNTY, NORTH CAROLINA—CEMENT CONCRETE PAVEMENT.

Highway Work in Wyoming

Rapid Progress Being Made in Spite of Adverse Conditions—$2,500,000 Worth of Work Under Way—Big 1920 Program

Construction work now under way in Wyoming will amount to a grand total of $2,500,000, according to recent reports. All of this work has been undertaken since March 1, 1919, and marked progress has been made in spite of unusual labor conditions and the high cost of materials.

At a recent letting, contracts were awarded for projects in all parts of the state for work to be done with federal aid. The improvements are being made upon a system of state highways coordinated with the highway systems of adjoining states and laid out with a view to forming connecting links in roads of national importance. The heavy traffic in the oil districts in the central part of the state has necessitated extensive improvements near Casper and Sheridan. Considerable work is also being done by the forestry officials of the second district on various projects in the national forests in the state.

ONE OF THE MANY GRADING OUTFITS OPERATED BY THE WYOMING STATE HIGHWAY DEPARTMENT..

The 1920 program as laid out by the State Highway Commission will be a pretentious one and will include the elimination of several dangerous grade crossings on the principal highways.

———ooo———

Dallas County, Texas, has $2,100,000 now available for road work. The money comes from the first issue of the county's road bonds authorized to the amount of $6,500,000.

Dedham, Mass., Has Motorized its Fire Department. A citizen of the town noticed the exhaustion of the horses of the department while responding to an alarm and was so impressed that he immediately offered the Dedham selectmen $11,500 for motor apparatus. This offer aroused so much enthusiasm that the town voted to motorize the entire department and a contract has been awarded for two pumpers, two city service trucks and one combination car.

Good Roads are Helping the Churches, according to a recent announcement from the Interchurch World Movement of North America. The organization has a force of agents making a study of church and religious conditions and their reports indicate that good roads are among the most important factors in increasing church attendance in rural sections. Where churches can be reached by graded or paved roads the percentage of the population attending church is considerably greater than it is in sections where no provisions are made for the improvement and upkeep of the roads.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
Editor

T. A. HULBERT
Managing Editor

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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIII DECEMBER. 10, 1919 No. 24

"THE BEST PAVED COUNTY IN THE SOUTH"

Buncombe County's claim of being "the best paced county in the South" may or may not be borne out by the facts. We do not have these facts in hand and should hesitate to render a decision, even if it were possible to do so. But the mere making of the claim shows the right spirit.

It has taken a good many years of propaganda to bring the people of the country to their present realization of the advantages of good roads, and the work is not finished yet. There are still many individuals and a few communities that have not been converted to the "gospel of good roads," as it used to be designated. But in most places it is understood that money used to build roads is invested rather than expended and that if the work is well done the roads built will yield handsome returns. This is especially true in many parts of the South and West where the task to be accomplished is especially great and the sources of funds are not so plentiful as they are in the more populous sections. Yet it is often true that funds for road building are more easily obtained in those sections than in the wealthier ones.

Whenever the citizens of a state, a county or a town lay claim to having the best paved highways, it is sure that they are alive to what good roads and streets mean to a community. And it is equally certain that the psychological effect of such claims upon the claimants will be an improvement in the community's transportation facilities.

REPORTS ON ROAD CONDITIONS

As noted elsewhere in this issue, some of the counties in the northern part of New York State are to have the benefit of daily reports on road conditions during the coming winter. Information on the condition of the highways in different towns will be sent by the town superintendents to a central bureau from which it will be passed on to the press and to automobile clubs for dissemination to those interested.

The benefits of such service are obvious and experience in other parts of the country where it has been tried out indicate that it is appreciated by the operators of motor trucks and automobiles. There seems to be no good reason why it should not become one of the duties of state and county highway departments.

PAVEMENT GUARANTEES

Few subjects are of more interest to highway engineers who have to do with city streets than is that of pavement guarantees. Various views are held on the subject, as was evidenced by the discussion brought forth by the report of the committee on pavement guarantees at the annual convention of the American Road Builders' Association last February. Another report was submitted by the committee at the annual meeting last month and is printed on another page of this issue.

Many contractors and more than a few engineers favor the elimination of guarantees, but it must be remembered that the guarantee, assured by a cash retainer, provides the city with protection that it must have through some plan. While a hardship may sometimes be imposed upon contractors, it is safe to assume that they are generally able to assure themselves of ample protection and that the city pays for all it gets. On the other hand, it is doubtful if what it does obtain could be gotten any cheaper in any other way. Inspection sufficient to eliminate the necessity of a guarantee would doubtless amount to much more than the cost under the present methods.

There is quite enough ground for arguments on either side of the question and it is certain that there is room for improvement in the present procedure. It is to be hoped that the matter will be considered further at the convention of the A. R. B. A. next February

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The Federated Roads Council of St. Louis, Mo., has been organized, with vice chairmen to be appointed in the twenty-seven counties lying nearest to St. Louis, within a radius of 100 mi. The construction of hard surfaced roads within this district and to secure the issuance of bonds for that purpose are the objectives of this organization.

Psychology Plays a Large Part in causing the drivers of cars to unconsciously keep to the right of a paved street or country road with a line marked down the center. The decided advantage of the center line mark was first noticed on the Baltimore-Washington Road where the concrete road surface was built one-half at a time, thus leaving a clearly defined line at the point of juncture, and drivers, almost without exception kept to their own side of the road. Chief Engineer Mackall of the Maryland State Roads Commission and Charles M. Upham, State Highway Engineer of Delaware, after observing results on the Maryland road plan to paint a black line down the center of their paved state roads.

The Economic Status of Guarantees for Pavements on Roads and Streets[*]

Your Committee has very carefully considered the points brought up in the discussion of its progress report during the 16th annual convention held in New York in February, 1919, and in the technical press immediately thereafter. It feels that certain of the criticisms made of its report were based upon an incomplete understanding of its aim and scope but realizes the difficulty of discussing a subject of this kind after listening to the reading of a somewhat lengthy and compresive report without having had opportunity to study it thoroughly.

It has been suggested that it would be helpful if the Committee were to indicate what it considers a proper period of reasonable life without repairs for various kinds of pavement under different conditions. An earnest effort to compile such a table which would cover all possible conditions clearly showed, however, that the wide variation necessary in a general schedule would render the figures worthless and would probably lead to a very heated discussion as to whether the figures cited were to be regarded as a measure of the life of various types of pavement when laid upon different kinds of foundations and subjected to traffic of various densities, and the attempt was, therefore, abandoned. Each set of conditions must be given individual consideration, and the Committee believes that the determination of such reasonable periods in any particular case would not be extremely difficult and that any competent engineer can do this satisfactorily.

The Committee's recommendation that the guarantee bond be supplemented by a cash retainer was based largely upon the difficulty sometimes experienced in having necessary repairs made within a reasonable time and was designed to provide a means of enforcing this necessary provision of any paving contract without first having to resort to a lawsuit. As a rule, a municipality has no fund available for this class of work and the cash retainer therefore serves two purposes:

1st. It tends to bring the contractor back to make the repairs, as he knows he will collect some money towards the expense involved.

2d. It gives the municipality cash with which to make the repairs and thus avoids the necessity of going through the formalities and often difficulties of securing an appropriation, with all the attendant delays.

In this connection the Committee recommended that a greater percentage be retained on resurfacing work as compared with new construction in order to provide for approximately the same amount of retained money per square yard of finished pavement in both cases. This did not mean, as was assumed by some members, that the Committee felt that resurfacing work, properly conducted, involved any greater guarantee liability than new construction work. On further consideration of the matter your Committee believes that reasonably adequate protection would be assured to the municipality by a reduction of the amount of the retained moneys from 10 to 20 per cent., as at first recommended, to 5 and 8 per cent., respectively. It further feels that such a provision cannot be justly held to be a curtailment of a contractor's working capital.

In arriving at this conclusion, your Committee takes the position that 15 ct. per square yard to cover guarantee liabilities may be assumed as a fair average. On this basis the following figures may be considered as typical and illustrative of the principle involved.

	Resurfacing		New Work
Construction cost per sq. yd.	$1.50		$2.50
10 per cent profit	.15		25
Guarantee	.15		.15
Total	1.80		2.90
Retained (8 per cent.)	.15	(5 per cent.)	.15
Payment on completion	$1.65		$2.75

In both cases the contractor receives a payment equal to his construction cost plus profit, the municipality retaining an amount practically equal to the sum included by the contractor in his bid as necessary to cover the guarantee provisions. This amount per square yard is the same for both types of construction and has not been expended by the contractor in his work and will not be expended by him except where defects in construction have occurred. While held by the municipality, the contractor will be paid interest on it. This amount, while sufficient to cover ordinary defects in workmanship and insure the making within a reasonable time of necessary repairs, is totally insufficient to cover extensive repairs rendered necessary by serious defects or failure of the work, protection against this being assured by the guarantee bond.

Your Committe further believes that the criticism that its provisions as to forfeiture of all retained moneys in case of failure to make ordered or necessary repairs is too drastic, is well founded and has modified its progress report in that respect by providing that the city may make these repairs at the expense of the contractor and such expense shall be deducted from the retained money. When any part of the retained money is due to the contractor only such balance as has not been expended by the municipality shall be considered to be due and payable. When the cost to the city of such repairs exceeds the amount of retained money, the balance shall be recoverable from the sureties.

It, therefoire, submits as its final report all of its progress report down to the paragraph commencing: "For new construction involving grading," etc. and adds thereto the following:

For new construction involving grading, foundation and wearing surface, we would recommend that an amount equal to 5% of the aggregate cost of these items be retained.

For resufacing on an old foundation, we would recommend retaining an amount equal to 8% of the cost of surfacing.

In the case of a 2-year guarantee the whole of the retained moneys should be payable at its expiration and not before. In the case of a 5-year guarantee, one-fourth of the retained moneys should be payable two years after the completion of the pavement and the balance in three equal installments. The date when payments of retained moneys become due shall be governed by the clause previously recommended for pavements completed and accepted between November 1 and May 15.

If the contractor, having received notice from the engineer, fails to make and complete the ordered repairs within a reasonable time (not to exceed thirty days in any case) the city shall have the right to undertake and complete the ordered repairs at the expense of the contractor and his sureties.

Opposition of the Farmers of Minnehaha County, South Dakota, to the proposed bond issue of $500,000 for the construction of a system of good roads in that county, caused the defeat of the proposition at the special election held for that purpose.

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[*] Final report of the American Road Builders' Association's committee on "Economic Status of Guarantees for Pavements on Roads and Streets," presented at the annual meeting, New York, N. Y., Nov. 7, 1919.
Committee: Francis P. Smith, Chairman, J. J. Hill, C. M. Pinckney, B. H. Wait, T. J. Wasser.

Daily Reports on Road Conditions in Northern New York Counties

Motor Truck and Automobile Operators in Monroe and Adjoining Counties will Have Benefit of Reports on Road Conditions in Their Vicinity During the Coming Winter

Due to the efforts of Meteorologist Luther M. Dey, who has secured the cooperation of the New York State Highway Department, the Rochester Automobile Club and the couny highway authorities, motorists in the Rochester district will this winter have access to a highway road report system that it is expected will prove the most complete and satisfactory that has yet been inaugurated. The system has been worked out with such detailed completeness that it insures a daily report on actual road conditions throughout Monroe County and five adjoining counties.

The United States Weather Bureau inaugurated road report work in a few states last winter, resulting in demands for the continuation of the work this winter, such reports having proved exceptionally valuable to truck shipping interests.

Road report cards will be sent to 72 town superintendents. Whenever a highway is obstructed the town superintendent will send in daily reports for that particular road unil all obstructions are removed. Reports on the road will cease until it is again obstructed, and in this way Mr. Dey will have daily reports on all obstructed roads in this district. The reports will be sent to the newspapers for publication and to the Automobile Club for distribution to the various sources of information to motorists.

The Pacific Highway

Opening of the Pacific Highway--A Brief Description of the Proposed Peace Portal to Commemorate One Hundred Years of Peace Between the United States and Canada

An interesting account of the progress made on the Pacific Highway and a description of the proposed peace portal to be erected near Blaine, Wash., were contained in a letter written some weeks ago by Samuel Hill, of Seattle, a copy of which has been given to "Good Roads." A part of the letter follows:

"September 20, 1920, the Pacific Highway Association proposes to open the Pacific Highway. It will be, as far as I know, the longest highway under one name suitable for automobile traffic anywhere in the world. There will be three official ceremonies and many demonstrations in connection with the opening of the highway.

"On July 4, 1915, at Blaine, Washington, was held the only meeting held anywhere in the world to celebrate the 100th anniversary of the signing of the treaty of peace between the United States and Great Britain, signed at Ghent, December 24, 1814, and promulgated some months later in the United States. At my invitation there came several thousand people to help in the celebration.

"It is proposed on or near this spot to erect a peace portal, a sketch of which has been drawn by the great architect, Mr. H. W. Corbett, the designer of the wonderful civic group of buildings at Springfield, Mass. This will be the first time in the history of the world that a peace portal has ever been erected, as far as I know. The Brandenberger Thor in Berlin was erected to commemorate the war victories, the Arc de Triomphe in Paris for the same purpose. This will be to commemorate the fact that for one hundred years, side by side, two great nations, whose territories join each other for 2,500 miles, have lived in peace and harmony with no forts, no swords, and no guns to keep the peace.

"The Pacific Highway Association owes its origin to Albert K. Todd of Victoria, B. C., who conceived the idea of a road from the Artic Ocean to the Antarctic. Later on I will send you a copy of the design of this arch, or peace portal. In a general way, it is to be of concrete, 65 ft. high, with two piers 25 ft. square, between which will be placed two doors of steel and concrete. One door will be opened and recessed in the walls, and in metal letters will be inscribed the words: 'July 4th, 1915, Open for 100 years.' On the other door in metal letters will be the words: 'May these doors never be closed.' Across the plinth on one side in letters or gold will be the words: 'Children of a common mother.' And on the other side in letters of gold, the words: 'Brethren dwelling together in unity.' It is proposed to raise funds for this peace portal by private subscription, that everybody may participate. An accurate accounting will be made of the cost of the site, structure, and all details, and everyone who believes that this will result in promoting peace will be allowed to contribute, that every child who stops and inquires what it means may be told the story of the two great nations that have lived in peace and harmony. Supscriptions may be sent to the Pacific Highway Association, Samuel Hill, President, Seattle, Washington. The second official ceremony will be held on the Interstate Bridge spanning the Columbia River between Washington and Oregon. The third ceremony will be held in San Francisco. There will be other metings held at various points en route to be determined upon later.

"This does not do away with the necessity of the marginal military highway proposed in a bill by Senator George E. Chamberlain of Oregon providing for the building of a road along the coast from British Columbia to Mexico, and supplementing the so-called Food Road, which will go up the Pitt River in California via Lakeview, Oregon, Prineville and Shaniko, joining the Columbia River at Spanish Hollow.

"I give you this information hoping that you will disseminate it as widely as possible, in order that we may enable all Americans and Canadians to join in the celebrating of this happy event."

Counties, Townships and Road Districts in Missouri have voted during 1919 a total of $16,000,000 for the construction of highways, according to a recent statement given out by the State Highway Commission.

The New York State Highway Department plans to build 33.65 mi. of road in the seventh highway district in 1920. The work is to be divided among the various counties of the district, as follows: Monroe, 7.69 mi.; Genesee, 3.50 mi.; Livingston, 10.34.; Ontario, 5.20 mi.; Orleans, 6.92 mi. It is estimated that the work will cost more than $1,000,000.

The Concrete Road on the Lebanon Mountain Contract will be finished to the West Pittsfield Shaker settlement, where the state road at Richmond begins, this fall, in the opinion of James W. Synan of the Massachusetts Highway Commission. Attention is called to the fact that as soon as work stops this fall the road will be open, as usual, until April of next year, when work will again proceed at full speed to complete the short piece of road from the Richmond Road to the bridge adjacent to the West Pittsfield railroad station. When this point is reached it will be necessary to make but a short detour around through Barkerville.

EQUIPMENT---TRADE---MATERIALS

New Patrol Heater

A new kettle for heating tar and other bituminous materials has recently been put on the market to meet the requirements of patrolmen. It is shown in the accompanying illustration.

The heater is made of sheet steel and is equipped with a cast iron grate and hinged fire-door. Its construction is strong but sufficiently light so that the kettle can be handled easily by one man.

LITTLEFORD PATROL HEATER

It is known as the Littleford patrol heater No. 68, and is manufactured by Littleford Bros., of Cincinnati, Ohio.

Special Truck for Road Work

A motor truck equipped with a special body for road building work is shown in the accompanying illustrations.

The body is of the "all purpose" or "utility" type, with removable tail gate and sides so that it can be used as a platform body. The tail gate is also arranged to swing from either the top or the bottom. The special feature of the body is its division into compartments by means of division boards. These can be so spaced that the compartments will hold certain measured quantities of aggregate or other material.

The operation of the truck is shown in the two illustrations. In one of them the truck is shown being loaded at the bin; in the other it is being dumped into the mixer skip.

The machine is known as the Brockway model R cement road building dump body and is manufactured by the Brockway Motor Truck Co., of Cortland, N. Y.

Kentucky Rock Asphalt Pavements

The use of Kentucky rock asphalt and its advantages as a wearing surface material were described in considerable detail in a paper presented at a meeting of the Kentucky Highway Engineers' Association held at Owensboro last month. The paper was written and read by Rodman Wiley, Chief Engineer of the Kentucky Rock Asphalt Co., who recently resigned as Commissioner of Public Roads of Kentucky. The data in the paragraphs following are taken from Mr. Wiley's paper.

Kentucky rock asphalt, according to his description, is a natural product composed of about 92½% of silica sand and about 7¼% of bitumen. It is quarried and pulverized to the consistency of coarse meal. A test of a sample of the material made by the Bureau of Public Roads is quoted as follows:

	Per cent. of Aggregate
Passing ¼-in. screen and retained on 10-mesh sieve..	1.1
Passing 10-mesh sieve and retained on 20-mesh sieve..	3.2
Passing 20-mesh sieve and retained on 30-mesh sieve..	3.5
Passing 30-mesh sieve and retained on 40-mesh sieve..	8.7
Passing 40-mesh sieve and retained on 50-mesh sieve..	9.9
Passing 50-mesh sieve and retained on 80-mesh sieve..	43.2
Passing 80-mesh sieve and retained on 100-mesh sieve.	13.2
Passing 100-mesh sieve and retained on 200-mesh sieve	9.7
Passing 200-mesh sieve	7.5
	100.0

The material, as shipped, is ready for use and can be laid with the equipment used for ordinary macadam construction. In new work it can be laid on a macadam

Receiving Load at Storage Bins

Discharging Into Mixer Skip

BROCKWAY TRUCK EQUIPPED WITH BROCKWAY MODEL R CEMENT ROAD BUILDING DUMP BODY foundation of limestone, sandstone or other aggregate. It can also be used to resurface worn-out macadam or other pavements.

Among the special advantages of the material, as claimed by Mr. Wiley, are cheapness, durability, low resistance to traffic and ease of maintenance. Its cheapness is due both to the fact that it can be laid on a foundation of local materials and to the fact that no elaborate plant is required for its construction. Its cost is especially low in Kentucky and neighboring states, of course, because of the low cost of its transportation.

In support of the contention as to the durability of the pavement, Mr. Wiley cites several instances in which the material has been down for some years. In 1907 a sample section of Kentucky rock asphalt road was laid by the Bureau of Public Roads at Bowling Green, Ky. In a letter written in 1912 the engineer who had had charge of the construction said: Annual inspection has been made since that time (1907) by engineers from the Office of Public Roads of the Department of Agriculture. The reports show that 'the pavement remained practically unchanged in appearance, with little evidence of wear, and the bitumen has retained its life to the present time.' " Mr. Wiley also refers to the experimental pavements laid near Columbus, Ohio, in 1909, saying that "after ten years' service, the pavement is in excellent condition and no funds have been expended for maintenance."

The ease of maintenance, according to Mr. Wiley, is due largely to the fact that no plant, no expert labor and no special tools are required.

18th Street Road, Dixie Highway, Leading From Louisville Ky., towards Camp Henry Knox—Kentucky Rock Asphalt Surfacing on Macadam Foundation—Laid in 1915.

Kentucky Rock Asphalt Surfacing Laid on Macadam Foundation on the Drives in the Grounds at the State Capitol Frankfort, Kentucky—Laid in 1916.

TYPICAL PAVEMENTS OF KENTUCKY ROCK ASPHALT

The Topp-Stewart Tractor Co., of Clintonville, Wis., has recently gotten out a new folder describing its 4-wheel drive tractor. The folder is printed in red and black and carries a large illustration showing the construction of the machine and a large page of smaller illustrations showing it in use.

At a meeting of the Board of Directors of the Stewart Motor Corporation, on November 1, the regular quarterly dividend of 2% on the preferred stock was ordered paid, also a 2½% dividend on the common stock. The company was incorporated seven years ago. Its rapid growth has necessitated the acquisition of larger quarters and the new nine acre plant recently purchased is now in full operation. The progressive assembly system is used in the new factory and will make possible a yearly production of 10,000 trucks.

"The Austin Wagon Loader" is the subject treated in a new catalog gotten out by the F. C. Austin Co., Inc., of Chicago, Ill. The catalog is 7¾x11 in. in. size and consists of 12 pages and covers. The loader is described in detail, the text being illustrated by several half-tone and line cuts. An abstract of the specifications and reports of tests made on the machine are included.

Wallis tractors form the subject of a 12-page booklet recently issued by the J. I. Case Plow Works, of Racine, Wis., sales agents for those machines. The booklet is 7¾x6½ in. in size, folded to 3⅞x6½ in. for mailing. The contents comprise a detailed description of the tractor, with full specifications. It is profusely illustrated by reproductions of photographs of the tractor and of its various parts. The booklet is printed in black and orange.

It was decided at a recent meeting of stockholders of the Packard Motor Car Co. to reduce the par value of the common stock from $100 to $10 per share. Arrangements have been made to exchange each present share of $100 par value for 10 shares of the par value of $10 each. The change was considered necessary because of the continued trading in Packard common stock, which is now selling above $280, a unit too large for satisfactory handling.

"Service" is the title of an unusually attractive booklet recently issued by the Austin-Western Road Machinery Co., of Chicago, Ill. The booklet is 9x12 in. in size and consists of 12 pages and covers. As indicated by the title of the book—in full "Service that Even Caesar Could Not Get"—its contents relate to the service facilities of the Austin-Western Company. It is exceptionally well printed in black and green with interesting marginal illustrations appropriate to the text. The two middle pages carry a map showing the locations of the company's service branches.

MEETINGS

Calendar of Coming Meetings

Dec. 8-10—Southern Commercial Congress—Eleventh annual convention, Savannah, Ga. Director General, Southern Building, Washington, D. C.

Dec. 8-11.—American Association of State Highway Officials.—Annual meeting, Louisville, Ky. Chairman, Geo. P. Coleman, State Highway Commissioner of Virginia, Richmond, Va.

Jan. 15-16, 1920—Southern Appalachian Good Roads Association—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Feb. 9-13, 1920—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Apr. 12-17, 1920—United States Good Roads Association.—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Apr. 16-17, 1920—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Good Roads Exhibit of the Delaware State Highway Department

The Delaware State Highway Department held its first annual good roads exhibit in the lobby of the Hotel du Pont, Wilmington, on Nov. 20, 21 and 22.

Included in the exhibits were maps, plans, photographs and models of plant and equipment. On the last day of the exhibit an all-day meeting of state, county and municipal engineers of Delaware was held. Governor Townsend gave a dinner to the engineers of the State Highway Department on the evening of Nov. 22.

A permanent organization was formed with officers as follows: President, Chas. M. Upham, Chief Engineer, State Highway Department; Vice President, Charles E. Grubb, Highway Commissioner of New Castle County; Secretary, Warren W. Mack, Assistant Engineer, State Highway Department; Treasurer, Harry Maier, Street and Sewer Department, City of Wilmington.

PERSONAL MENTION

C. S. Bessee, has resigned as engineer with the United States Bureau of Public Roads and has become associated with the Scenic Federated Roads Highway District, his headquarters being at St. Maries, Idaho.

A. H. Hinkle, for many years engineer in charge of maintenance with the Ohio State Highway Department, has been appointed chief engineer of maintenance with the Indiana State Highway Commission. Mr. Hinkle will devote the winter to the work of organizing the new maintenance department preparatory to the opening of work in the spring when the State Highway Commission will take over the maintenance of the 3,200 mi. of road comprising the state highway system.

H. H. Faber, of the Highway Department of Polk County, Texas, has been retained as office engineer

Ralph K. Linville, of Baltimore, Md., has been appointed city engineer of Danville, La., in place of J. O. Magruder, resigned

Maj. Irving V. A. Huie, Second Deputy Commissioner of the New York Highway Commission, will become Secretary of the New York Highway Commission on Jan. 1, 1920, succeeding Royal K. Fuller, resigned.

Royal K. Fuller, Secretary of the New York State Highway Commission, has tendered his resignation, to take effect January 1, 1920. Mr. Fuller, who was formerly engaged in newspaper work, will become associated with a motion picture organization.

William J. D. Lynch, formerly assistant town engineer and superintendent of public works of Nutley, N. J., has resigned his position to become affiliated with the Franklin Contracting Co., of New York, N. Y., as superintendent of bituminous road construction.

* * *

The Arkansas State Highway Department has awarded contracts for the construction of an 85-mi. highway which will connect Jonesboro, Newport, Harrisburg, Paragould and Walnut Ridge. The roadway will have a 6-in. gravel base with 2½-in. asphaltic surface, 18 ft. wide. The contractor is John R. Scott of St. Louis.

Florida Highways, from Miami to Tampa, have been newly marked during the summer. The marking consists of a blue stripe, arrow shaped, on telephone poles and other convenient surfaces along the road to be traversed, while at regular intervals are erected signboards explaining fully what the markers mean and giving the names of the towns through which the road runs.

On Account of a Revision in the State's Estimates for the completion of the Cambria-Wilson Highway, Niagara County, New York, must pay an additional $26,775. The total additional appropriation is $76,500, of which the county's share is 35%. The highway is 8 mi. long. Three years ago 3 mi. of it were built, after which work on the road was suspended on account of the failure of the contractor. This year a new contract was given to the F. J. Mumm Contracting Co., of Buffalo, at its bid of $129,753.40.

Plans for Meeting the Rush for New York Automobile Licence Plates are being made by Secretary of State Francis M. Hugo who has a large supply of the plates on hand ready for distribution. The contract calls for approximately 600,000 sets of plates, which are to have pea-green backgrounds with black numerals. The congestion that annually comes to the New York, Buffalo and Albany offices the last of January and the fore part of February will be relieved if all motorists apply as soon after December as possible for their plates.

At a Meeting of the Community Council of the Chamber of Commerce of Rochester, N. Y., recently, legislation for the purpose of protecting trees along country highways and for the planting of more trees was advocated by Alan F. Arnold, of the New York State College of Forestry at Syracuse, N. Y. Mr. Arnold, who is in charge of landscape extension work at the university, said that the New York State College of Forestry and the New York State Motor Federation were interested in promoting highway planting throughout the state.

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GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE
WITH WHICH IS INCORPORATED
THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series. Vol. LVII.
New Series, Vol. XVIII
NEW YORK, DECEMBER 17, 1919
Number 25

The Basis of an Economic Theory of Highway Transportation

By ROBERT C. BARNETT*

Like the aim of the skillful gunner, that insures the bullet hitting the target, an economic theory enables the engineer to do efficiently what the layman does bunglingly, if at all. An economic theory is simply a definiton of principles setting forth the relation between cause and maximum useful effect. It consists of a set of criteria, or laws, governing the interrelations of the factors contributing to the desired result. In the case of highway development, the desired result is transportation.

It requires no extended observation to justify the conclusion that the location and construction of highways without regard to the end they are to serve—that is, transportation—will lead to no permanecy of improvement. Yet, as much of the work that is being done today ignores this end, it will undoubtedly be discarded later and replaced with a more economic improvement. The annual penalty that such present work imposes on a growing traffic will become so burdensome in a few years that a revision of grade line and location will become imperative in many cases. These revisions will cost more to make at some future date than they will today. We are, as it were, compounding our burdens by neglecting to develop the economic principles of highway transportation. This, too, in face of the fact that large investments are being made for highway construction and improvement and that larger appropriations are contemplated for the future.

If anyone doubts the need for the application of economic theory, let him center his attention for a while on the miles of road projected along old locations without adequate correction of alignment, without sufficient grade reduction, without enough width of right of way to permit of borrowing or wasting earth as a good profile requires, without sufficient easing of sharp turns, without the elimination of excess distance and excess lift, without a traffic census and a careful estimate of the traffic to be cared for and of its probable growth. Then let him picture in his mind the ever increasing stream of traffic that must pass over such roads as time goes by; let him figure the annual penalty that such traffic has to pay for the early makeshifts now being perpetuated; let him compute the heavy burden that falls directly on the users of these roads, and reflexively on the contiguous population; let him realize that the annual cost of operation runs up faster as traffic increases than does the annual cost of providing and maintaining the roadbed. Then, if his mind can react to these phenomena he will begin to see the importance of developing the economics of highway transportation as rapidly as it can be done and that, too, before large sums are spent on road construction.

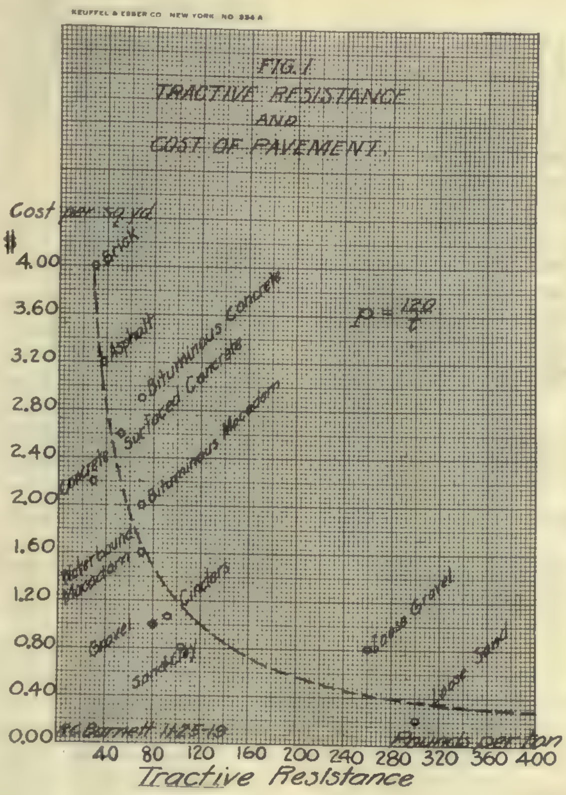

FIGURE 1

It, therefore, now behooves us to consider what basis or foundation we have upon which to erect our structure of economic theory. As in the development of any economic theory, there are four major steps to be taken. These are:

1. Forming a complete and definite concept of the objective—the thing to be attained;
2. Determining and classifying the various factors which produce or in any way affect the objective;
3. Determining the quanitative relation between each factor and the desired result, or objective;
4. Determining from the aforesaid relations an interrelaion among the factors such that a maximum economy will result.

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*Economic Engineer, Kansas City, Mo.

Elementary as the first step seems, it is not obvious at all, for many persons think of the road as the principal thing and, therefore, focus their attention on the technique of road construction, thus losing sight of the fact that a road can produce nothing by itself; that it is only a means towards an end, and that that end is transportation. The objective we should seek is economic transportation.

Transportation is measured in ton-miles, hence the producing of a ton-mile at the minimum cost is the desideratum. The cost per ton-mile is derived by dividing the total annual cost by the total ton-mileage. The total annual cost is composed of three items, viz., the annual cost of roadbed, the annual cost of power and the annual cost of vehicles. These three major cost items are again subdivided as shown in the accompanying table:

TABLE I.—COST ITEMS.

Annual cost of roadbed:
1. Interest on construction cost:
    (a) Land for right of way.
    (b) Clearing and grubbing.
    (c) Grading
    (d) Paving
    (e) Bridges, culverts and drainage.
    (f) Fences, signs, markers, safety gates.
    (g) Engineering and legal expenses.
2. Maintenance
    (a) Repairs.
    (b) Renewals
3. Administration.
4. Amortization.

Annual cost of power:
1. Interest on power plant
2. License and taxes
3. Insurance
4. Administration
5. Amortization
6. Gasoline
7. Oil, grease and waste
8. Drivers' salaries
9. Maintenance of power plant—repairs and renewals.
10. Garaging

Anual cost of vehicles:
1. Interest on first cost:
2. License and taxes
3. Insurance
4. Administration
5. Amortization
6. Maintenance—repairs and renewals, including tires
7. Garaging

$$\left.\begin{array}{l}\textbf{Total}\\ \textbf{Annual}\\ \textbf{Cost:}\end{array}\right\} = \left\{\begin{array}{l}\text{Annual}\\ \text{Cost of}\\ \text{Roadbed,}\end{array}\right\} + \left\{\begin{array}{l}\text{Annual cost}\\ \text{of motive}\\ \text{power,}\end{array}\right\} + \left\{\begin{array}{c}\text{Annual cost}\\ \text{of}\\ \text{vehicles}\end{array}\right.$$

There is an interrelation among these cost items such that as some are increased, others are decreased, but not in the same amount necessarily. It is necessary, therefore, to seek such an adjustment of these factors as will permit of the minimum unit cost being secured.

In its most general terms, the problem presented is that of transporting a given annual tonnage between two locations at a minimum cost. The primary factors upon which the cost depends are of two kinds, fixed and variable. The fixed factors are basic and depend upon commercial and physical conditions. They are:

1. Annual tonnage;
2. Air line distance between the two termini;
3. Difference of elevation between termini;
4. Hours of work per annum.

The variable factors are the ones admitting of adjustment and are,

1. Excess distance due to deviations from the air line;
2. Excess lift due to deviations from a uniform grade plane connecting the two termini;
3. Curvature;
4. Ruling grade;
5. Tractive resistance;
6. Sliding friction between road surface and tires;
7. Resistance of pavement to wear;
8. Capacity of the economic truck or of truck with trailers;
9. Engine performance.

From these primary factors a number of derivative factors are obtained, such as:

1. Traffic density, depending upon the number of trucks in the equipment and the trips per day;
2. Speed required, depending upon capacity of truck;
3. Number of trucks and trailers in equipment, depending upon the annual tonnage and capacity of truck;
4. Wheel load, depending upon capacity of truck;
5. Width of roadway, depending upon density of traffic and speed;
6. Drawbar pull, depending upon wheel load and sliding friction;
7. Wear on tires, power plant and vehicles, depending upon load and tractive resistance.

As it is these primary variable factors that are susceptible of adjustment, and thereby the attainment of the minimum cost, we will next consider what cost items in Table I are affected by each factor.

Excess Distance

It is readily seen that an increase in excess distance calls for more land for right of way, more clearing and grubbing, more grading, more paving, and consequently, more fees for engineering and legal service. In this way the cost of construction is increased, and the interest thereon. A little reflection will also show that an increase in excess distance produces a greater charge for maintenance, administration and amortization of roadbed. The items under operation that increase with an increase in excess distance are: gasoline, oil, grease and waste, and maintenance of power plant and vehicle.

Excess Lift

An increase in the excess lift factor means steeper grades, less excavation and, therefore, less cost for grading. However, these steeper grades mean an increase in the amount of mechanical work done, hence the cost of gasoline, oil, grease, waste, and maintenance of power plant and vehicle will be greater than before.

Curvature

Every turn or curve in the highway calls for additional width of pavement at such points and some banking of the roadway, which add to the cost of construction. Also, such curvature necessitates a reduction in speed which, in turn, adds to the cost of equipment, because more equipment is needed to transport a given tonnage when the speed is reduced. Likewise, the cost of maintaining a curve is somewhat greater than that for a straight piece of roadway, and so will be the cost of administration and amortization of roadbed.

Ruling Grade

The ruling grade of a highway between two localities is the steepest grade. This ruling grade limits the load that can be hauled on the highway to that which can be hauled up such grade. For transportation purposes, a highway is no better than its ruling grade. This means that in order to transport a given tonnage, more equipment will be needed for the steep grade than for the other. Hence the interest on the equipment will be greater, as will also the license and taxes, the insurance, the cost of amortization and garaging. The annual salaries paid drivers will vary as the number of trucks, while the cost of gasoline, oil, grease, waste and maintenance of power plant and vehicles will vary as the amount of mechanical work done, and for this reason will increase with the steepness of the ruling grade.

Tractive Resistance

The cheaper forms of pavement have the higher unit tractive resistance. In a general way, the cost of a pavement varies inversely as its unit tractive resistance. This is shown in Figure 1. This factor also influences the cost of maintenance, because the higher the tractive resistance, the greater the thrust of the driving wheels against the pavement in order to propel the car. This thrust sets up longitudinal shears and tends to displace the particles of the pavement. Also,

(Continued on Page 256.)

GOOD ROADS
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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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THE ECONOMICS OF HIGHWAY IMPROVEMENT

Added emphasis to a matter which we have several times pointed out in these columns is given by the article by R. C. Barnett, which is printed elsewhere in this issue. The author has written several other articles along the same lines for "Good Roads" and needs no introduction to its readers.

The outstanding facts set forth by the author in his introductory paragraphs are that in much of the highway work now being done there is not sufficient recognition of the true purpose of road building—the providing of facilities for transportion—and that unless the real end of highway betterment is kept constantly in mind, the work of the road builder can not be performed efficiently.

The real problem that the road builder is called upon to solve is, as Mr. Barnett expresses it, "transporting a given annual tonnage between two locations at a minimum cost." In other words, it is not merely the building of a good road between those two places; it is something more. In a way too, it may be something less, for it is easily understood that in order to provide for transportation between given points at a minimum cost the road builder might be called upon to build what might be called a poor road instead of a good one. This, of course results from the need of taking into consideration not only the various items entering into the cost of the road, but also the many included in the cost of operating vehicles, the amount and character of goods to be carried, the available funds and a multitude of other factors.

For instance, a certain area of country might produce a crop that could be carried to market within a period of a few weeks in the late summer or early fall and besides this there might be only a very small traffic. It is obvious that it would be an economic mistake to construct an expensive hard-surfaced road to accommodate that traffic; a good gravel road, or perhaps even a good earth road, would meet every requirement. Of course, if the building of the more expensive road would result in a sufficient development of the country to bring a large increase in traffic, the greater expenditure would be justified.

While the foregoing is an extreme case, it illustrates the point that transportation is the real end sought in road building and that road building problems must be solved as transportation problems.

THE CONFERENCES ON HIGHWAY TRANSPORTATION

Very real benefit to highway transportation ought to result from the conferences on highway transportation scheduled in connection with the motor truck shows to be held in New York City and Chicago next month.

There are many problems to be solved in connection with providing the country with the facilities it need for traffic over its highways. They must all be met and that means that the makers and users of motor vehicles as well as the builders of roads must give their best thought to the various questions that are constantly arising. And the various classes interested must work together if the best results are to be achieved; no one of the parties at interest can do it all.

The conferences promise an opportunity for thus getting together. According to the schedule, which is printed on other pages, the speakers will include road builders, men connected with motor truck and tire manufacturers, transportation men, economists and others directly or indirectly connected with the work.

SNOW REMOVAL

Within a very short time, perhaps before this number of "Good Roads" reaches its readers, the highway departments of some of the states will be confronted with the task of clearing snow from the main arteries of travel.

A year ago, partly because of the lessons learned from the war's demands for transportation and partly because of the severity and the heavy snowfall of the preceding winter, snow removal was occupying a good deal of attention from road officials and somewhat extensive plans had been made for it in some of the states. Then the comparatively open winter and the pressure of other matters turned attention away from snow removal. But there is no reason to expect that the coming winter will be as mild as that of 1918-19 and if the constantly growing highway traffic is to be kept moving steps must be taken to open the roads as soon as it becomes necessary and to keep them open.

This should be an easier task than it was when the work was more or less of an innovation. Several states have met the situation successfully—at least on their main roads—and their experiences have been made available for the use of others. In addition, some progress has been made in developing machinery and equipment for the work and, because of the shortage of common labor and its high cost the fullest advantage will have to be taken of every mechanical aid obtainable.

As in the past, the motor truck will probably play an important part in clearing the roads. There are plows that can be attached to a truck and trucks can also be used to haul road machines, drags and other machinery that can be utilized to either move the snow or pack it down.

The Federal Highway Council is urging the necessity of snow removal and reports that the general public is awakening to the need of such work. The Council bases its appeal not only upon the necessity of keeping the highways open to traffic but also upon the need of clearing away the snow to prevent deterioration of the roads. Both are important and there is real need of giving immediate attention to planning the work.

Automobile Thefts in Pennsylvania

During the Present Year Over 2000 Pennsylvania Cars Have been Stolen, More Than Half Since the Passage of Especially Drastic Theft Law

The records of the Pennsylvania State Highway Department show that 2,049 automobiles have been reported stolen in 1919, and that 1,352 were stolen after the approval of what has been called the most drastic theft law enacted in any commonwealth, said law providing that automobile thieves may be fined $5,000 and be imprisoned at hard labor for ten years. Of the cars reported stolen 272 have been recovered, and in addition, the Automobile Division is holding under advisement 17 cases in which the records show that the cars have been stolen but proof of property has not yet been made by the owners.

Since Sept. 15, 1919, the Automobile Division every 15 days has mailed bulletins giving records of cars stolen to the secretaries of states of all commonwealths and to police chiefs and burgesses of Pennsylvania cities and towns. In each case the name of the car and the manufacturer's number are given. For each car registered the division keeps two cards. On one is the engine number and on the other the manufacturer's number. When application for registration of a machine is received, search is made to see whether or not a license has already been issued for a car with similar engine and manufacturer's number. This system of checking up is expected to disclose theft. The bulletin service of the division is soon to be extended so that all of the prominent garages in Pennsylvania will receive lists of stolen cars.

Plans for Snow Removal in Pennsylvania

State Highway Department Announces Arrangements for Keeping Highways Open—Reports on Road Conditions Being Made by Department

The State Highway Department of Pennsylvania has issued the following statement: "From experience gained during the severe winter of 1917 and 1918, the Department made extensive plans to take care of snow removal operations during the season of 1918 and 1919. The intention was to use snowplows attached to department trucks, as well as road machines and wooden drags. However, it was necessary only once during the winter of 1918 and 1919 for the department to attempt snow removal. For the coming winter's operations the department has purchased 10 snowplow truck attachments in addition to the 16 already on hand. There are 225 road machines, property of this department, which will be transferred to the main lines of travel. The district organizations will handle this phase of the work, as they do the department's general maintenance operations.

"We are transferring our truck equipment to those particular highways which must be opened as quickly as possible after a snowfall. The road machines will be used on highways of secondary importance and supplementing the truck equipment. There is a caretaker on each section of from 5 to 6 mi. in length, and he is given authority to hire additional labor if circumstances warrant."

The Department on Dec. 10 began the making of daily reports on road conditions to meteorologists of the weather bureaus in Philadelphia and Pittsburgh. Motor clubs, manufacturers and the public in general will then be informed of the condition of the main connected hard-surfaced highways over which east-west traffic passes. This service will cover the Lincoln Highway between Philadelphia and Pittsburgh; the National Pike within the boundaries of Pennsylvania; the highway between Chambersburg and Harrisburg; the William Penn Highway between Reading and Easton. Farmers, manufacturers, automobile clubs and road users in general who wish accurate information regarding the condition of the main traveled roadways mentioned may secure same from the weather bureaus in Philadelphia and Pittsburgh or the Bureau of Information, State Highway Department, Harrisburg.

Plans Being Made for Canadian Transcontinental Highway

Canadian Organization to be Formed for the Promotion of a Road from Halifax to Vancouver

Definite plans have been formulated for the organization of a Canadian association along the same lines as the Lincoln Highway Association, the construction of a transcontinental road from Halifax to Vancouver being its objective.

The Ontario Motor League has invited A. F. Bement, Vice President of the Lincoln Highway Association to tell of the steps taken and the progress made in the construction of "America's Main Street."

Keen interest in the movement is displayed throughout all the provinces and committees have been formed in both Toronto and Ottawa for the furtherance of the project, with branches in all the provinces that will be traversed.

Good roads development is being aided and urged by the Government in all parts of the Dominion.

The Basis of an Economic Theory of Highway Transportation

(Continued from Page 254)

as tractive resistance increases, the amount of mechanical work done in transporting a given annual tonnage increases, hence, the cost of gasoline, oil, grease, waste and maintenance of power plant and vehicle will increase.

Sliding Friction

The tractive effort of the driving wheels to push the car forward is dependent upon the weight on the drivers and the coefficient of friction of the tires on the pavement. This push of the drivers must exceed the tractive resistance of the pavement for motion to result. This excess push is available for accelerating the car, climbing grades, overcoming air resistance and pulling trailer loads. The larger the coefficient of sliding friction, the steeper the grades that can be climbed and the greater the trailer load that can be pulled. This would mean a decrease in equipment, a lower interest charge, less insurance, less taxes, less amortization, less garaging and less salaries for drivers. The amount of mechanical work done would not be affected by an increase in sliding friction hence the cost of gasoline, oil, grease, waste and maintenance would not change.

Resistance of Pavement to Wear

The greater the resistance to wear, the longer the pavement will last for a given traffic, consequently the annual cost of maintenance will decrease as will the cost of administration and amortization of roadbed. The items of operating cost will not be affected.

Capacity of Truck

The larger the truck capacity, the greater the load carried on the driving wheels. This augmented wheel load calls for a thicker pavement and, therefore, a higher unit cost for same and a larger interest charge. Likewise, the cost of maintenance, administration and amortization is increased. The cost items under operation are also affected by truck capacity or its subsidiary factor, wheel load. As the truck capacity increases, less equipment will be required for a given annual tonnage and the price per truck will increase

(Concluded on Page 260.)

HIGHWAY TRANSPORTATION

Federal Highway Council Urges Snow Removal

The Federal Highway Council is urging upon highway officials wherever the winter snowfall is heavy the necessity of keeping the main roads open.

Attention is called to the fact that the transportation of coal and other fuel is of much greater importance in winter than it is in summer and that it is as important to keep the rural mail routes and main market roads free from snow as it is to keep railroad tracks open. Highway officials report that the public is taking more and more interest in snow removal and a prompt response to the Council's plea is expected.

Even were there little or no traffic during the winter months, according to the Council, the cost of snow removal would be justified by the effect upon the roadbed. Snow melting on the the highways softens the road and when snow is not removed traffic gradually breaks through the wearing surface when a thaw comes, resulting in ruts and mudholes later.

Highway Transport Conferences at Motor Truck Shows

Conferences on highway transportation subjects are to be features of the motor truck shows in New York and Chicago, Jan. 3-10 and Jan. 24-31, respectively, as noted in "Good Roads" for Dec. 3. According to a recent announcement, each session will be devoted to one particular subject, with its subdivisions. The schedules for the New York conferences follow:

Monday Afternoon, Jan. 5. Merchandising Motor Trucks—The Trade Segregation Plan; Effective Advertising; The Farm Field.

Monday Evening, Jan. 5: Motor Vehicles in Passenger Transportation—Replacing Street Cars with Motor Buses; Motor Bus Operation.

Tuesday Afernoon, Jan. 6: Smoothing the Path of the Motor Truck—Working for Highway Improvement; Taking an Interest in Legislation; The Automobile Legislative Council.

Tuesday Evening, Jan. 6: Increasing Motor Haulage Efficiency—Cost Accounting, Routing and Dispatching; Loading and Unloading Devices; Incentive for Drivers and Helpers.

Wednesday Afternoon, Jan. 7: Selling on the Firing Line—Proven Sales Plans; Developing Prospects; Promoting Rural Motor Express and Other Enterprises.

Wednesday Evening, Jan. 7: Rural Motor Express—Its Opportunities as an Investment and Business Career; Its Advantages to the Shipper; Its Benefits to the Producer and Consumer.

Thursday Afternoon, Jan. 8: In the Matter of Service—The Truck Ower's Viewpoint; the Truck Dealer's Plan; the Manufacturer's Policy.

Thursday Evening, Jan. 8: Aids to Motor Truck Efficiency—Trailers; Pneumatic Tires.

Friday Afternoon, Jan. 9: Selling Motor Transportation—Handling Motor Truck and Passenger Cars Together; Offering a Complete Transportation Line.

Saturday Evening, Jan. 10: Highways and Motor Transport—Relation of Roads to Operating Cost; Progress in Highway Improvement; Constructing Roads for Moor Truck Traffic.

The subjects for the Chicago conferences are practically the same as those for the New York meetings. The conferences will be held on the afternoons of Jan. 26, 27, 28 and 29 and on the evenings of Jan. 26, 27, 28, 29, 30 and 31.

Among the speakers scheduled to discuss various general subjects are the following:

Highways and Highway Traffic: Arthur H. Blanchard, Professor of Highway Engineering, University of Michigan; W. G. Thompson, State Highway Engineer of New Jersey; M. O. Eldridge, Director of Roads, American Automobile Association; H. S. Quine, Goodyear Tire & Rubber Co.; Robert C. Hargreaves, Goodrich Tire & Rubber Co.; Pyke Johnson, Secretary, Highways Committee, National Automobile Chamber of Commerce; George C. Diehl, Chairman, Good Roads Board, American Automobile Association; J. E Pennybacker, Asphalt Association; S. M. Williams, Chairman, Federal Highway Council.

Motor Express Operation: Tom Snyder, Secretary, Highways Transport Division, Indianapolis Chamber of Commerce; Prof. J. E. Boyle, of Cornell University; J. D. Eggleston, Chairman, Highways Transport Committee of Iowa; F. W. Fenn, Secretary, Motor Truck Committee, National Automobile Chamber of Commerce; E. E. Peake, Secretary, Kansas City Motor Car Dealers' Association; George D. Wilcox, Commerce Motor Truck Co.; E. A. Williams, Jr., Garford Motor Truck Co.

Motor Truck Operation: W. J. L. Banham, General Traffic Maanger, Otis Elevator Co.; Roderick Stephens, Stephens Fuel Co.; George H. Pride, President, Heavy Haulage Co.; W. H. Kennedy, Transportation Engineer; Joseph Husson, Editor, "Commercial Vehicle;" Walter Wardrop, Editor, "Power Wagon;" George W. Veale, Timken-Detroit Axle Co.; Ralph C. Ragnon, President, Service Managers' Association of New York; H. E. Meriwether and H. W. Drew, Transportation Experts, Packard Motor Car Co.; T. M. Knight, Armour & Co.; E. E. LaSchum, General Superintendent, American Railway Express Co.; Walter M. Todd, Service Manager, Pierce-Arrow Motor Car Co.

Farmers' Motor Haulage Problems; Senator Arthur Capper of Kansas; A. R. Kroh, Goodyear Tire & Rubber Co.; E. T. Meredith, Publisher, "Successful Farming;" Raymond Olney, Editor, "Power Farming."

Highway Transportation Needed to Relieve English Industrial Congestion

Better Highways Necessary to Relieve the
Crowded Living Conditions in Industrial
Centers is Conclusion Reached at English
Conference on Highways and Town Planning

Better highways will relieve the congested living conditions in English industrial centers, according to the conclusions reached at a conference on roads and town planning held recently at Leeds, England.

W. Rees Jeffreys, for several years the secretary of the British Road Board, pointed out that the concentration of industry in the large cities had resulted in the building of as many as 50 houses to the acre.

"We all agree," he said, "that these conditions are impossible if we want to raise an A-1 race. We have to distribute the population, and the present standard is 10 to 12 houses to the acre for the working class, whilst for the better class the ideal is 2 or 3 to the acre."

While Mr. Jeffreys advocated spreading the population over a greater area, he pointed out that it would result in no good unless rapid transit between homes and working places were provided. It was argued that to bring this about there would have to be provided a traffic system by which vehicles of various types could be operated at maximum speeds—new roads must be built through developed areas, existing roads widened and straightened and others reconstructed.

"There are all sorts of difficulties in the way of carrying out this idea, important as it is," Mr. Jeffreys said, "and the most important of them is our present system of local government."

Continuing, he pointed out that there are more than 70 different independent local road authorities within 10 mi. of Leeds. If the radius is extended to 15 mi. the number of authorities reaches 80, and if to 20 mi. the number is increased to at least 150. All of these local authorities are responsible for the maintenance of the roads and they lack machinery for the coordination of their activities.

The establishment of regional boards was suggested as a remedy for the situation. Such board would be clothed with authority to study the traffic problems of the future and to construct arterial roads in advance of development.

Cost of Running a Car

An accurate record of the cost of running a passenger automobile has been given out by Sidney B. Bowman, of the Sidney B. Bowman Automobile Co., the New York distributor of the Kissel automobile. The record was kept by A. S. Johnston, of Los Angeles, Cal., and covers the cost of running a 1914 Kissel during four years.

Mr. Johnston's total mileage was 40,006.2 mi. The gasoline consumption was 2,294 gals. and the oil and grease used amounted to 133 gal. and 46½ lb., respectively. Mr. Johnston figured the cost for gasoline, oil and grease at 1.25 ct. per mile. The cost of new tires was $445.21 and that of new tubes $79.80, making the cost per mile for the two 1.16 ct. He figured the cost of upkeep, including repainting, washing, polishing, battery recharging, garage charges, repairs, accessories and tips at $372.63. Depreciation, based on a life of 100,000 mi., was figured at $960 and the interest on the investment (based on six years' use of the car) was figured at $254. Insurance was figured at $154.

Average mileages were figured as follows: Gasoline, 17.44 mi. per gallon; oil, 301 mi. per gallon; grease, 860 mi. per pound; 11,987 mi. per tire, and 12,290 mi. per tube.

Technical Training in Road Building

Technical Schools Paying More Attention to this Work, According to R. D. Chapin, Former Highway Transport Committee Head

The importance of highway engineering is being more and more realized by technical schools, according to R. D. Chapin, formerly chairman of the Highway Transport Committee of the Council of National Defense. Mr. Chapin has taken a deep and practical interest in this matter, as evidenced by his establishment of a fellowship in highway engineering at the University of Michigan. In a recent statement he said:

"A survey conducted under the direction of the Commissioner of Education at Washington has disclosed the fact that of 127 technical schools, 115 are now giving courses of one kind or another in this work. The Bureau of Education is evidencing an active interest in the furtherance of this work, and I am told that every effort is being made to bring about a higher standard in all of the schools.

"There is scarcely any movement whch could be more important at this time. Recent reports showed that approximately $1,300,000,000 is now available for road work in the treasuries of the counties, states and nation. If the best results in durable roads, properly located, are to be obtained, we must have skilled engineers do the work. Nor is the field a transient one. The movement for a national highway system is rapidly gaining momentum, and so far from seeing any lapse in road construction, coming years are certain to see more and more attention concentrated upon this subject.

"As a corollary to the actual work of construction, we will find an increasing field for experts in highway transportation, just as railroad operation developed traffic operators. Here, too, the educator will play his part, as the man who goes into this work will need to be fully equipped not only with a knowledge of the physical conditions of the territory he selects, but also with a knowledge of the economic relationships of transportation in its various forms, and an understanding of legal conditions.

"As highway transportation grows in volume and importance it will tend to open a vast field for employment in other countries as well as our own, and there could be no better assurance of a sound policy than well-grounded courses on these subjects in our colleges.

"The men who take up these studies will have to be assured that compensation will be commensurate with time and labor spent in preparation, but the savings which they effect will offset many times the difference in their earning power."

A prominent Cuban automotive dealer, now visiting the United States, states that the sentiment regarding transportation methods in his country at the present time is, "Good-bye to two-wheeled mule carts and welcome motor trucks."

The production of the Packard Motor Car Co. for the calendar year of 1920 will be more than double that of the year of 1919, according to a recent announcement by the company. It has also been announced that while there may be some minor changes in seating arrangements, there will be no "1920 models."

The New York City Municipal Reference Library recently received a bulletin of a well-known motor truck concern announcing the creation of a new engineering service department to study the prospective truck buyer's needs, and "to recommend the installation of one or more trucks only when an analysis shows that such installation will result in service improved and increased money profits."

Hundreds of thousands of dollars are saved ranchers in northern Texas every winter by the work done by the motor truck in saving cattle that under the old conditions would starve, according to the Nash Motor Co. During severe winter weather it used to be impossible for the ranchers to get food to their stock. The lowered vitality due to lack of food resulted in a high mortality. Nash "Quads" are now extensively used to carry feed to the cattle.

"Two Popular Methods of Getting Killed" is the title of the latest safety first pamphlet issued by the Pere Marquette and other Michigan railroads. The two methods are the highway crossing method and walking along railroad tracks.

St. Joseph County, Missouri, plans to spend $112,000 on the improvement of highways during the year 1920, and thus increase the 150 mi. of improved roads in that county to 200 mi. Much of the work will be confined to resurfacing, and this is planned to put all of the main highways into good condition and so bring the farmer to the city more often than at present.

The Shortage of Ships During the War compelled agricultural development in Chile. According to "Commerce Reports" this development has a direct bearing on the recent activity for the improvement of highways, and this subject will receive special attention from the National Congress and from agricultural organizations during the coming year. American paving material is being used to repave the road between Valparaiso and Vina del Mar, one of the most heavily traveled roads in Chile

MEETINGS

Calendar of Coming Meetings

Jan. 15-16, 1920—Southern Appalachian Good Roads Association—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Jan. 29, 1920—National Highway Traffic Association—Annual convention, International Amphitheatre, Chicago, Ill. President, Arthur H. Blanchard, University of Michigan, Ann Arbor, Michigan.

Feb. 9-13, 1920—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Apr. 12-17, 1920—United States Good Roads Association.—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Apr. 16-17, 1920—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Highway Transport Conferences

As noted in "Good Roads" for Dec. 3, a series of conferences on highway transportation and allied subjects will be held in connection with the motor truck show in New York City, Jan. 3-10 and a similar series at the Chicago show, Jan. 24-31.

A schedule of the conferences and a list of some of the chief speakers on various topics is printed on other pages of this issue, under "Highway Transportation."

American Association of State Highway Officials

The fifth annual meeting of the American Association of State Highway Officials was held at the Hotel Seelbach, Louisville, Ky., on Monday, Tuesday, Wednesday and Thursday of last week. The program, which was printed in full in "Good Roads" of Dec. 3, was followed very closely. Nearly all of the state were represented at the meeting.

The special features of the opening session on Monday forenoon were the presidential address of A. R. Hirst, State Highway Engineer of Wisconsin, and the reports on the road situation in various sections of the country presented by state highway department officials.

The afternoon session on Monday was devoted to the consideration of the general topic, "Problems of Administration." Especial interest attached to the report on salaries of highway engineers presented by A. N. Johnson, Chairman of the Committee on Salaries of Engineers in Public Service, of the American Association of Engineers.

"Problems of Design" was the topic of discussion on Tuesday forenoon and on Wednesday the matter of state and federal relations was taken up. Thursday forenoon's session was given up to the presentation of papers on various road building topics and the concluding session on Thursday afternoon was the business meeting.

The resolutions adopted recommended increased road building appropriations; continuance of the present plan of allotting federal aid funds; and higher salaries for engineers, in accordance with the schedule proposed by the American Association of Engineers.

Officers for 1920 were elected as follows: President, Paul D. Sargent, Chief Engineer, Maine State Highway Commission; Vice President, W. S. Keller, State Highway Engineer of Alabama; Secretary, Joseph Hyde Pratt, Secretary of the North Carolina State Highway Commission; Treasurer, John H. Mullen, Maintenance Engineer, Minnesota State Highway Commission.

The following were elected members of the executive committee: Thomas H. MacDonald, Chief, Bureau of Public Roads, U. S. Department of Agriculture; George E. Johnson, State Engineer of Nebraska; A. B. Fletcher, State Highway Engineer of California; S. E. Bradt, State Superintendent of Highways of Illinois, and H. R. Neel, State Highway Engineer of Georgia.

National Highway Traffic Association

The annual convention of the National Highway Traffic Association will be held at the International Amphitheatre, Chicago, Ill., on Thursday, Jan. 29, 1920. Three sessions will be held, at 10 a. m., 2:30 p. m. and 8:30 p. m. The program follows:

Forenoon

Arthur H. Blanchard, President, National Highway Traffic Association, presiding.

Report of the Committee on "Highway Transport Franchises," Chairman, F. W. Fenn. Secretary, Motor Truck Committee, National Automobile Chamber of Commerce.

Report of the Committee on "Interrelationship of Highway, Railway and Waterway Transport," Chairman, Prof. Henry E. Riggs, University of Michigan.

"Effect of Car Tracks on Traffic Capacity of Roadways," by George W. Tillson, Consulting Engineer, La Grange, Ill.

Report of the Committee on "Traffic Limitation Strips on Roadway Surfaces," Chairman, C. W. Hubbell, City Engineer of Detroit, Mich.

Report of the Committee on "Sign Posting for Detours and Through Routes in Municipalities," Chairman, Elmer Thompson, Automobile Club of America.

Afternoon

Joint Session of Highway Transport Conference of the National Automobile Chamber of Commerce and the National Highway Traffic Association. Subject: "Highways and Motor Transport." Arthur H. Blanchard, President, National Highway Traffic Association, presiding.

"Taking an Interest in Motor Truck Legislation," by Harry Meixwell, Jr., Secretary, Automotive Industries Legislative Commission, New York.

"Value of Highway Transport Surveys," by F. Van Z. Lane, Transportation Engineer, Packard Motor Car Co.

"Interrelationship between Highway Transport and Back-to-the-Farm Movement," by R. C. Hargreaves, Manager, Detroit Branch, B. F. Goodrich Rubber Co.

Evening

Joint Session of Highway Transport Conference of the National Automobile Chamber of Commerce and the National Highway Traffic Association. Subject: "Highways and Motor Transport." R. C. Hargreaves, Vice President, North Central Division, National Highway Traffic Association, presiding.

"Relation of Highways to Motor Truck Operating Cost," by

Arthur H. Blanchard, Professor in Charge of Highway Engineering and Highway Transport, University of Michigan.

"Progress in Highway Improvement," by William G. Edens, President, Illinois Highway Improvement Association.

"Constructing Roads for Motor Truck Traffic," by T. R. Agg, Professor of Highway Engineering, Iowa State College.

"Status of Legislation Relative to Snow Removal from Inter and Intra-State Highways," by Raymond Beck, Chief, Goodrich National Touring Bureau.

PERSONAL MENTION

John D. Waldrop has been appointed division engineer of the North Carolina State Highway Commission, with headquarters at Raleigh, N. C., succeeding R. P. Coble, resigned.

R. P. Coble, formerly a division engineer of the North Carolina State Highway Commission, has resigned his position and will go to Roanoke, Va., as secretary and treasurer of the Atlantic Bridge Company.

H. S. Mattimore, formerly connected with the New York State Highway Commission, for nine years in charge of physical testing work, has resigned, and accepted a similar position with the Pennsylvania State Highway Commission.

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The Basis of an Economic Theory of Highway Transportation

(Concluded from Page 256.)

more slowly than the size, hence the amount of money invested will be less as also will the interest thereon. Taxes will decrease as the cost of equipment becomes less. The license fee should be adjusted to equal the maintenance charge caused by the trucks and so can be left out of consideration, as the charge for maintenance of roadbed covers it. The cost of insurance will bear a direct relation to the cost of equipment and would, therefore, decrease with the larger size of trucks. As the cost of garaging depends on the number of trucks, and as the number of trucks required decreases with the increased size of truck, this item will decrease. The cost of gasoline will increase as the capacity of truck increases, but as less trucks are required, this increase will be offset by the decrease in the number of trucks in the total equipment. Likewise, the items of oil, grease and waste will follow the cost of gasoline. The cost for salaries for drivers will decrease as the number of trucks decreases, or as the capacity of truck increases. The cost of maintaining the equipment bears a direct relation to the amount of mechanical work done per annum. The amount of work done increases for each truck as the size increases, but as the number of trucks becomes smaller, the total work would not change so much, so without definite information as to the rates of change for these variables, the effect on the cost item cannot be predicted.

Engine Performance

By engine performance is meant the amount of power the engine delivers to the driving wheels per unit of gasoline consumption. This, of course, depends upon the skill of the driver, as well as the efficiency of the motor. The more power delivered to the driving wheels for a unit consumption of gasoline, the higher the factor of engine performance. We see, therefore, that the cost of gasoline, oil and grease will be less as the factor of engine performance increases.

To fix better these factors and the cost items affected by them upon our minds, a summarization of them is presented in tabular form.

TABLE II.—SUMMARY OF COST ITEMS AS AFFECTED BY THE PRIMARY FACTORS

Excess distance affects cost of:
- Interest on Construction:
  - Land for right of way
  - Clearing and grubbing
  - Grading
  - Paving
  - Engineering and legal expenses
- Maintenance of roadbed
- Administration of roadbed
- Amortization of roadbed
- Gasoline
- Oil, grease and waste
- Maintenance of power plant and vehicle.

Excess lift affects cost of:
- Grading
- Gasoline
- Oil, grease and waste
- Maintenance of power plant

Curvature affects cost of
- Pavement
- Equipment
- Maintenance
- Administration
- Amortization

Ruling grade affects cost of:
- Equipment
- License and taxes
- Insurance
- Garaging
- Amortization
- Salaries paid drivers
- Gasoline
- Oil, grease and waste
- Maintenance of power plant

Traction resistance affects cost of:
- Pavement
- Maintenance of roadbed
- Gasoline
- Oil, grease and waste
- Maintenance of power plant

Sliding friction affects cost of:
- Equipment
- Insurance
- Taxes
- Amortization
- Garaging
- Salaries paid drivers

Resistance of pavement to wear affects cost of:
- Maintenance of roadbed
- Administration of roadbed
- Amortization

Capacity of truck affects cost of:
- Pavement
- Maintenance of roadbed
- Administration of roadbed
- Amortization of roadbed
- Equipment
- Taxes
- Insurance
- Garaging
- Gasoline
- Oil, grease and waste
- Salaries for drivers
- Maintenance of equipment
- Amortization of equipment

Engine Performance affects cost of:
- Gasoline
- Oil, grease and waste

Before any progress can be made towards developing an economic theory, it is necessary to ascertain the quantitative relation between these factors and the several cost items which they affect. Some of the relations are obvious, but others will require more observation and experimentation to disclose the desired laws. For example, it is necessary to determine from observation the relation between the cost of maintaining power plant and vehicle and the amount of mechanical work done per unit of time. Also the effect of curvature in increasing the cost of maintaining the roadbed should be investigated. The resistance of different types of road surfaces to wear should be determined in relation to the amount and kind of traffic using them. A more detailed and comprehensive discussion of these relations will be taken up in a later article.

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At the Recent Kansas Free Fair, held at Topeka, the importance of advertising by road machinery companies was demonstrated. County commissioners from several counties inspected the displays and have since contracted for the purchase of tractors and road machines.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Dust Preventives & Road Binders

By PREVOST HUBBARD

Chief, Division of Road Materials Tests and Research, United States Office of Public Roads. Octavo: 416 pages. Cloth: Illustrated, $3.00, postpaid.

THE E. L. POWERS COMPANY
150 NASSAU STREET, NEW YORK

Cheaper Rock Drilling In Trenches

At Winston-Salem, N. C. — Contractors reduced the cost of drilling rock in a sewer trench 80% by substituting

SULLIVAN ROTATORS

for hand drilling

The trench was about three feet wide and the rock cut was 400 feet long, ranging from three to twelve feet in depth. With two Sullivan Steam Tube Rotators, holes three to four feet deep were put in, three to five feet apart. Sixty per cent. dynamite was employed, the holes being filled about two-thirds full and the balance tamped in clay. The rock was hard and broken.

Bulletin 2470-F Describes "Rotators"

Sullivan Machinery Co.
130 SOUTH MICHIGAN AVENUE, CHICAGO

With common labor at $5.00 a day can you afford to let your men stand idle while the trucks are absent? Lightning Loaders will keep all hands constantly busy. Can you afford to let a truck stand twenty minutes while it is being loaded? A Lightning loader will fill a truck in three minutes.

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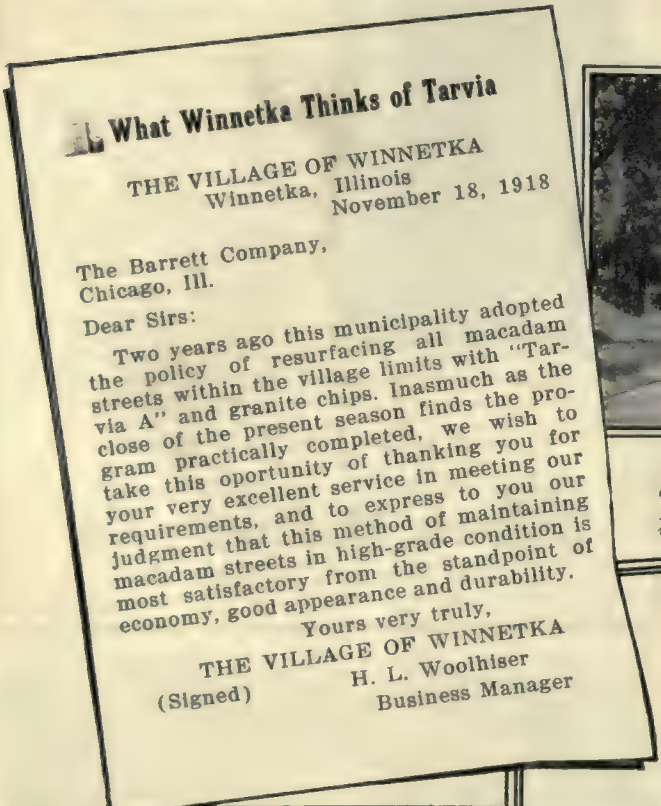
Tarvia

Preserves Roads
Prevents Dust~

Upper—Hubbards Woods, Green Bay Road, Winnetka, Ill. Original treatment, "Tarvia-A" over macadam in 1907. Kept in prime condition up-to-date with the same material.

Lower—Elm Street, Winnetka, Ill. Scarified and treated with "Tarvia-A" and granite chips in 1917.



What Winnetka Thinks of Tarvia

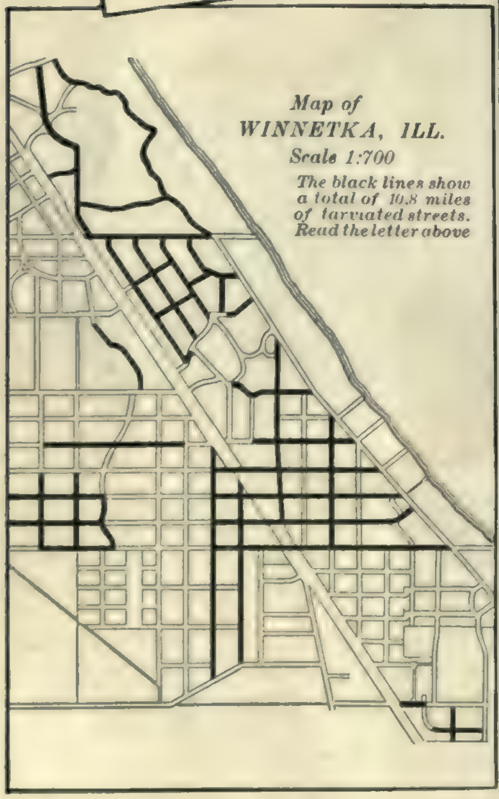
THE VILLAGE OF WINNETKA
Winnetka, Illinois
November 18, 1918

The Barrett Company,
Chicago, Ill.

Dear Sirs:

Two years ago this municipality adopted the policy of resurfacing all macadam streets within the village limits with "Tarvia A" and granite chips. Inasmuch as the close of the present season finds the program practically completed, we wish to take this oportunity of thanking you for your very excellent service in meeting our requirements, and to express to you our judgment that this method of maintaining macadam streets in high-grade condition is most satisfactory from the standpoint of economy, good appearance and durability.

Yours very truly,
THE VILLAGE OF WINNETKA
(Signed) H. L. Woolhiser
Business Manager



Map of
WINNETKA, ILL.
Scale 1:700
The black lines show a total of 10.8 miles of tarviated streets. Read the letter above

How Winnetka, Ill., obtained beautiful streets at low cost

A FEW years ago Winnetka streets were much like those of hundreds of other villages to be found all over the country—beautiful homes on both sides, separated by muddy roads in wet weather and clouds of dust in dry weather.

Then the Village Council got busy. The property owners were canvassed and asked to contribute part of the cost of a good roads program.

The result was 5.8 miles of Tarvia streets laid during the first year, a third of the cost, amounting to 15 cents per front foot of the abutting property, being paid by the property owners, and the rest by the village.

Last year all the rest of the macadam streets were tarviated, so that today Winnetka ranks among the best-paved villages in America.

Up-to-date municipalities and road authorities use Tarvia—because it gives durable, all-the-year-round roads at the lowest possible cost; because Tarvia roads are dustless, mudless and frost-proof; because they stand up under severe motor traffic; because they quickly pay for themselves in reduced maintenance costs.

That is why Tarvia is the standard road-making material in most American communities.

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVII.
New Series, Vol. XVIII

NEW YORK, DECEMBER 24, 1919

Number
26

Foundations for Warrenite-Bitulithic*

A Discussion of the Relative Merits of Resilient and Rigid Bases for Warrenite-Bitulithic Surfaces, and of the Use of Old Macadam

By GEORGE C. WARREN†

At the outset let us consider three general propositions.

1. Practical experience is the best guide: "The proof of the pudding is in the eating."

2. One remedy for every disorder is unscientific and not good practice and savors of the "quack" in medicine. Similarly an engineer who holds that one type of construction of either foundation or wearing surface is the most efficient and economical for all, or most conditions, has a "one track" impractical min.d.

3. The essential requirements of a pavement foundation are: (a) Resiliency; (b) Strength.

Between these two more or less compromise must be given, dependent upon the conditions of each particular road, and here is where the broad evenly balanced mind of the engineer is essential.

As a third and only somewhat less important consideration the speaker includes: (c) As close union between the base and surface as is practicable with due consideration to the other factors. It is noticed that we place strength of foundaion second. This is not accidental. In fact, the speaker, based on a large experience, believes that extreme strength of foundation, which necessarily includes rigidity is actually detrimental under many, if not most conditions of sub-soil and drainage.

Resiliency on the other hand is an extremely important factor in consideration of the matter of wear and tear of the pavement or road surface. Where natural or proper artificial drainage is provided and the sub-soil is of a character which can be rolled to a reasonably solid condition, resiliency can be given first place in consideration of the foundation for a stable, monolithic resilient pavement or road surface.

On the other hand if a road or pavement sub-base is weak through poorly drained or weak sub-soil, strength with its attendant evil of rigidity becomes the most important and controlling factor for consideration. It is futile to say that because a certain type of foundation was a success or failure on road "A" it will be the same success or failure on road "B", the conditions of which are very different.

The highest degree of tensile strength and its attendant rigidity necessarily carry with them the certainty of more or less cracking from contraction and heaving from expan-

WARRENITE-BITULITHIC PAVEMENT ON OLD MACADAM BASE, COMMONWEALTH AVE., BOSTON, MASS.

WARRENITE-BITULITHIC PAVEMENT ON OLD MACADAM BASE, MICHIGAN BLVD., CHICAGO, ILL.

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*Paper presented at the 25th annual convention of the American Society for Municipal Improvements, New Orleans, La., Nov. 11-14, 1919.

†President, Warren Brothers Company.

sion under climatic changes, because of the fact that there is no "give" short of a break. Serious cracks in a pavement foundation will cause corresponding cracks in the wearing surface. In the speaker's home city of Boston he has seen granite block pavement laid on a rigid Portland cement concrete base, with rigid filler, actually cracked through the granite block under sudden temperature change. The strength and rigidity of both base and surface clearly caused the cracks. The cracking is immediately followed by serious wearing of the edges of the cracks under normal traffic.

If we wanted to break a surface with the blow of a hammer we would place it on a rigid, solid stone or anvil, knowing that if we should place the substance on a sheet of rubber (which is the acme of resiliency), the blow would have no effect whatever. So in a pavement surface. If other conditions including drainage, sub-soil and character of wearing surface make the use of a resilient base practicable, then the wear and tear on the wearing surface under the blows of traffic are vastly less than if laid on a rigid base.

With these general principles let us consider details.

1. Macadam roads, whether of crushed stone, gravel, slag or oyster shells, are resilient and still solid enough to hold the weight of traffic as distinguished from the motion of traffic.

There are in existence today such macadam roads which have cost millions of dollars and which as wearing surfaces would not sustain the traffic of modern motor vehicles, but which if not removed would provide an economical base either as they are or, if worn too thin, with proper surface addition of new metal. There are too many years and too varied practical experience behind us to permit controversy on this engineering proposition.

In the experience of the organization with which the speaker is associated, this has been successfully demonstrated by: (a) Fifteen years' successful results of use in more than 100 municipalities and under all widely varying climatic conditions of the United States and Canada; (b) use to the extent of over 8,000,000 sq. yd.

And yet we find strong agencies working a powerful propaganda intent on preventing the economic conservation of these millions of past expenditures.

Reference to a few specific instances under widely varying traffic and climatic conditions should suffice, as follows:

Highland Avenue, Birmingham, Ala., laid in	1904
Dartmouth Street, Boston, Mass., laid in	1903
Commonwealth Avenue, Boston, Mass., laid in	1915
Sheridan Road Boulevard, Chicago, Ill. laid in	1906
Michigan Avenue Boulevard, Chicago, Ill., laid in	1907
Columbia River Highway, Oregon	1915

Incidentally, periodic traffic records on Michigan Avenue Boulevard, Chicago, will be of interest:

Date of Record	Motor Driven Vehicles	Horse Drawn Vehicles	Totals
Aug. 16, 1907	1884	1024	2908
July 26, 1912	10462	126	10598
Sept. 2, 1919	20179	25	20204

Note that in the twelve years the total traffic increased 7 times while in the same period the horse drawn traffic had reduced from over 30% to only ⅛ of 1%. This shows how rapidly the horse is becoming obsolete as a means of pleasure traffic. As to truck traffic, we are rapidly approaching the same condition; which means new problems and elimination of a considerable number of the old problems of road construction as to both foundation and wearing surface.

In order to, so far as possible, avoid disturbance of the old macadam, it is important to "humor" the grade and, as closely as practicable, follow the old established grade, merely knocking off the humps and using the material to fill the depressions. On country roads particularly, regardless of the type of old construction or new foundation or wearing surface, the best practice is to merely level off and build on the old grade. Under general country road conditions no harm results from raising the grade a few inches and, generally speaking, the economic advantages are very great both in drainage and first cost, as well as subsequent maintenance, by slightly raising the road surface above the surrounding country.

In conclusion of the subject of surfacing old macadam, it should be borne in mind that the integrity of the old roadbed should be carefully proved by test holes or still better, test trenches across the road at frequent intervals. If such test develops a depth of say 6 in. or more of well compacted crushed stone, gravel, slag or oyster shells, with the coarse aggregate predominating, it is safe to say that the foundation is adequate for such a stable, dense, monolithic water-proof surface as we are discussing. If such tests show a deficiency of such old metal, then there is still enough of any old material to make its conservation most economical for reinforcing by the surface addition of a more or less varying depth of new metal.

New Compressed Stone Base

The principles embodying this construction differ only sightly from those which pertain in the case of old macadam base.

First attention should be given to drainage, and second to compression of the subgrade. With a well drained, well compacted subgrade there need be no question of the sufficiency of a well laid compressed stone base, under most traffic and climatic conditions.

It is desirable that the lower portion of the base shall be of as large stone as the local conditions permit. If crushed stone is used it is desirable that the largest particles be as large as 3 to 4 in. in diameter. If economically available it is desirable to lay a lower course of quarry or field stone, preferably slabs, about 4 in. thick, laid on the flat side. Often in country road construction through stony or mountainous country such as prevails in New England and the mountainous regions of the far West and many other sections, such slabs or other large pieces of stone are not only the best but the least expensive material for the bottom of the base. The large stone should, of course, be supplemented by the laying of a sufficient quantity of new smaller stone to provide the desired depth and contour and the whole compressed by heavy roller until a sound base which will not creep or compress under further rolling is provided.

Under the extremely heavy traffic of war conditions in France and Belgium, it was found that rather flat stone as a lower course and a total depth of 8 to 9 in. of metal would sustain the weight of the immense motor truck and artillery traffic, but without an additional substantial wearing surface it would not long sustain the motion of traffic.

This construction of new compressed stone base and Warrenite-Bitulithic surface has been practically and successfully used to the extent of over 12,000,000 sq. yd. during the past 18 years, and over 3,000,000 sq. yd. are under construction and contract during the present year.

Some notable examples are:

1. The entire State of Oregon, including a large mileage now under contract with the State Highway Department and in nearly every city and county of the state, beginning with the City of Portland in the year 1903, since which

(Concluded on page 264.)

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
Editor

T. A. HULBERT
Managing Editor

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NEW YORK, N. Y.

Cable Address: Gudrodes, New York

Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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DECEMBER. 24, 1919
No. 26

FOUNDATIONS FOR BITUMINOUS PAVEMENTS

A strong plea for the use of foundations of material other than cement concrete is contained in the paper by George C. Warren, President of the Warren Brothers Company, which is printed on other pages of this issue. While the paper treats specifically of foundations for the pavement laid by the Warren Company, the arguments advanced are equally applicable to any of the bituminous concrete or macadam wearing surfaces.

The use of macadam foundations is nothing new, nor is the author alone in the position he assumes. Broken stone foundations have been used very extensively and for a long time, and many engineers—especially of late—have advocated still wider use of that type of base. For instance, at the annual meeting of the American Road Builders' Association last month, the report of the committee on "Reconstruction of Narrow Roadways of Trunk Highways with Adequate Foundations and Widths for Motor Truck Traffic" was amended to include the use of such foundations. The report, as submitted, read as follows:

"Where a new construction, your Committee reaffirms its recommendation that all foundations be of concrete."

This sentence was changed by vote of the meeting to read as follows:

"Where a new construction, your Committee reaffirms its recommendation that all foundations be of concrete or other materials used so as to give equivalent strength."

No one can deny that the best proof of a pavement foundation's suitability is satisfactory service, and there is ample evidence that macadam foundations have given satisfaction, even under heavy traffic. Of course, there are doubtless cases in which a cement concrete foundation is required and in which it will prove the most economical. But it is difficult to find justification for specifying cement concrete for all pavement foundatons in all cases, particularly when another type of base can be put down for less money—as is very often the case.

THE A. R. B. A. CONVENTION

Though the seventeenth annual convention of the American Road Builders' Association is considerably over a month away, there are already unmistakable indications that the gathering will be one of unusual importance and that the exhibition of road building materials and machinery will be an unusual one.

Naturally, both of these results of the Association's efforts were to be expected. During the war the annual conventions were considerably affected by the restrictions of one kind and another imposed by the Government to expedite war work and by other conditions existing in a country engaged in a war of unprecedented magnitude. While there was no lack in interest in the meetings, it was inevitable that the attendance should be somewhat below normal and that the show feature should be carried out on a smaller scale than in previous years.

Now, however, practically all of the war-time restrictions have been lifted and, moreover, road work is assuming an importance that it never had before. Enormous sums are being expended and there is almost a certainty of still greater expenditures in the future.

While no announcement of the Louisville program has been made, it is known that the papers and discussions will cover thoroughly the multitude of subjects that demand the attention of road builders and that they will be participated in by some of the leading authorities in the country. It is also understood that the exhibition space is being taken rapidly and that the reservations already made assure a display of unusual excellence and variety.

A STEP IN THE RIGHT DIRECTION

The salary of the state highway engineer of Texas, according to a recent report, has been increased from $6,000 a year to $10,000. We are pleased to record this and impelled to emphasize it, because it marks a step in the right direction.

Engineering is a notoriously underpaid calling, as we have frequently remarked in these columns. And highway engineering offers no contract to other branches of the profession in this respect. As a matter of fact, it is perhaps less well rewarded if account is taken of the large sums of money that are often expended under the direction of highway officials.

The granting of an increase to State Highway Engineer Windrow is worthy of note for another reason. The report is that he accepted the position at a salary of $6,000 a year with the understanding that at the end of six months he would be given $10,000 a year if he succeeded in proving that his services were worth that much and that otherwise he would resign. It is evident that he has made good—which is another fact that we are pleased to record.

Foundations for Warrenite-Bitulithic

(Concluded from Page 262.)

date over 2,000,000 sq. yd. have been laid in the City of Portland alone. Of all this vast area of Warrenite-Bitulithic in the State of Oregon laid during the past 18 years, all is on what this paper discusses as "resilient" bases, to wit: either old macadam, new compressed stone, or dense bituminous concrete.

2. In Salt Lake City and elsewhere in the state of Utah, over 200,000 sq. yd. are in practical, successful use in the city alone during the past ten years, and over 30 mi. of country road in the several counties during the past three years. In Utah portions of compressed base are crushed stone anl other portions iron furnace slag. The celebrated Orange Grove Avenue, Pasadena, Cal., is laid on compressed stone base, has had no repairs and the contour is in perfect condition after 9 years' use.

3. Within the past two weeks, following about seven years' practical successful experience, the city of Twin Falls, Idaho, has contracted for over 300,000 sq. yd. of Warrenite-Bitulithic laid on new compressed stone base.

Dense Bituminous Concrete Base

In connection with Warrenite-Bitulithic surfaces dense bituminous concrete base has been adopted during the past 7 years to the extent of over 3,000,000 sq. yd. in over 50 municipalities; and we can say without equivocation that there is no type of foundation which as a whole has resulted in so nearly absolutely and uniformly successful results.

It will be noted that the Warrenite-Bitulithic surfaces unite to a high degree with old macadam and new compressed stone bases, because the surface becomes compressed into the spaces between the upper portion of the base stones. In the case of dense bituminous concrete base the union of the surface with the base is absolute, because both courses, being of the same character, under the heat of the surface mixture and the pressure of the roller become absolutely united so there is no line of cleavage and possible displacement.

The total depth of dense bituminous concrete base and Warrenite-Bitulithic surface ranges from 5 to 5 in. The mineral aggregate of both courses may be either crushed stone or gravel. In the far West where bituminous materials are comparatively cheap and where clean, sound gravel is economically available, this construction has been generally laid at lower cost than is possible with an adequate depth of a rigid Portland cement concrete base. In the East under past low prices of the cement. Portland cement concrete base has had the advantage in the first cost and consequently very little bituminous concrete base has been laid in the East. Under present uniformly high cost of Portland cement, however, in many if not most places the dense bituminous concrete base construction is now generally as low if not lower than the Portland cement concrete base.

Portland, Oregon, has 500,000 sq. yd. and Pendleton, Ore., having high altitude and rigorous climatic conditions, 150,000 sq. yd. of this surface construction, Warrenite-Bitulithic on dense bituminous concrete base, where they have the practical test of seven years' successful use. California, Arizona, Idaho, Utah, Montana, Washington, Wyoming and British Columbia have large areas.

Following the successful use in all the far West states and provinces, the United States War Department supplemented by the United States Bureau of Public Roads, adopted dense bituminous concrete base for the Warrenite-Bitulithic pavement on all of the principal roads of Camp Lewis, (near Tacoma.) Washington, to the extent of aproximately 150,000 sq. yd. We can say without fear of contradiction that no cantonment roads of any type whatever have proved as uniformly successful under the vigorous army cantonment traffic as the roads referred to in Camp Lewis, where local bank gravel was used as the mineral aggregate of both wearing surface and base.

Road Work in Cook County, Illinois

Bond Issue of $5,000,000 Voted at the Last Election Brings Total for Past Six Years to $8,000,000—To Be Used for Building Comprehensive County System of Trunk Lines

The voting of a $5,000,000 road bond issue in Cook County, Illinois, assures the completion of a road system that will be "the most comprehensive and extensive system of any county in the United States," according to Wm. G. Edens, President of the Illinois Highway Improvement Association. During the past six years the county has voted three bond issues, the other two being for $2,000,000 and $1,000,000, respectively, making a grand total of $8,000,000.

"This, when expended," Mr. Edens wrote recently to "Good Roads," "will complete a hard-surfaced, durable highway system of state aid and county bond issue roads, connecting the 27 farming townships and the 102 towns and villages of Cook County with all the principal through route arteries from Chicago into the farming section of our county. Besides, these trunk lines will connect with the principal highways of the adjoining counties—Lake, Du Page, Kane and Will, and will furnish through route communication for traffic coming into our state from Wisconsin on the north, Iowa on the west and Michigan and Indiana on the northwest and east, and from interior downstate Illinois. When completed it should give Cook County the most comprehensive and extensive system of any county in the United States.

"Considering the bad road conditions in this state for more than one hundred years, we take a natural pride in the results which we feel will soon be obtained. The good roads press, machinery and manufacturing element, the material people, the members of the engineering profession—in fact, all the elements of our state—have taken a conservative and sane view of the matter and have cooperated in a way that makes us all feel proud of our citizenship and our commonwealth.

"When our five federal aid projects are completed early next year, we will be ready to begin on other important trunk lines included in the $60,000,000 state road bond issue."

———ooo———

Citizens of Louisville and of Oldham County, Kentucky, have subscribed $37,500 of the $47,000 assigned as the county's share of the cost of building an improved road along the Kentucky side of the Ohio River between Cincinnati and Louisville. The entire cost of the project is estimated at $2,500,000.

Consulting Engineers of St. Paul, Minn., report considerable activity in improvements in the smaller towns of the Northwest. Street paving is especially popular in towns of under 5,000 inhabitants, several blocks having been laid within the last few months in towns which heretofore have had no paving. Many miles of country roads have also been improved. The increased cost of this work seems to be no deterrent.

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Crusher Run

Royal K. Fuller, Secretary of the New York State Highway Commission, has tendered his resignation to take effect on January 1st, and it has been accepted by Commissioner Greene. Mr. Fuller was secretary of the Department in 1913 and 1914, during the administration of Commissioner Carlisle, and was reappointed by Commissioner Greene last April. He has accepted a position in the moving picture industry. Mr. Fuller remarked when tendering his resignation that never in the history of the Department had it been so highly organized and so free from potitics.

Maj. Irving V. A. Huie, who has been second deputy commissioner, has been appointed secretary to succeed Mr. Fuller, and Capt. A. W. Brandt, who has been assistant to Maj. Huie, and who has been an engineer with the Department for nine years, has been promoted to second deputy commissioner. Under the provisions of the highway law he has charge of the maintenance and repair of highways. Capt. Brandt is a resident of Wayne County.

The associates of Royal K. Fuller at the Highway Department, and his friends tendered him a farewell dinner at the Ten Eyck Hotel. The division engineers, and former Highway Commissioner Carlisle were among the guests at the dinner.

Commissioner Greene received a petition from the residents of Altamont, asking that, in designing the new road from Altamont to Voorheesville, he follow the old route. After the Commissioner held a hearing at Altamont, the consensus of opinion was in favor of the upper road being followed. This route will avoid a grade crossing, and shorten the distance between the two towns, will be a better location for drainage and will accommodate more traffic.

One of the biggest conflicts in the coming session of the Legislature will be between the canal and highway interests.. Both will fight for a bond issue, but as only one can be authorized in any one year, one will have to give way to the other. County boards of supervisors, automobile and other organizations are sending resolutions and petitions to Governor Smith, asking for a $100,000,000 highway bond issue. This is declared necessary in order to finish up the connecting links in the state's highway system, and also because there is now left only $10,000,000 in the highway fund for next season's work, and the budget alone.

calls for $15,000,000 for next year's maintenance work

The Board of Trustees of the New York State Road Builders' Association held its annual meeting on Monday, Dec. 8, at the rooms of the Association.

At the letting of the New York State Highway Department, held on Dec. 9, proposals for nine roads were received out of the 13 contracts advertised. In his address to the contractors, Commissioner Greene announced that better and stronger pavement would be built next year than ever before. The following were the awards made: Belmar Contracting Co., Inc., Oakwood Avenue, Rennsselaer County, $41,906.75; John B. Dower, Malta-Bemis Heights, Pt. 1, Saratoga County, $167,257.00; Wm. G. Fox, Rexford Flats-Wait Corners-Groom Corners, $94,109.00; Rosoff Engineering Co., Castle Creek-Whitney Point, Broome County, $304,874.00; John D. Rust, Sandy Creek-Smartville, Oswego County, $95,405.24; Fred W. Knickenburg, Bennington-Attica, Wyoming County, $130,388.68; Sweeney & Boland, Canisteo-Whitesville, Pt. 3, $56,369.90.

The large contract for building the Castle Creek-Whitney Point reinforced concrete road, 6.93, was awarded to the Rosoff Engineering Company, New York City. This is the fourth large contract which has been awarded to this company this season.

Action for the recovery of claims under the Knight Bill, reimbursing contractors for their losses during the war period, was commenced on Monday, Dec. 8, at Buffalo, the case of the Dale Engineering Co., being used as a test case. This case was selected by the attorneys as offering a standard covering all the points involved. Appeal will be made from the decision of the Court of Claims, regardless of which side may be the victor, to the Appellate Division of the Supreme Court. This may reach the Appellate Division at its March term, and it would be possible to have the decision handed down by the Appellate Division at the May, 1920, term.

Before the Highway Improvement Conference called by Governor Smith will be laid the proposition of requiring counties to pay half the cost of highway maintenance as well as of construction.

J. E. Pennybacker, of the Asphalt Association, is disputing the claims of State Highway Commissioner Greene that concrete roads are the least expensive in the long run. Mr. Pennybacker uses as an argument that there is more traffic on lower Broadway, New York, in one day than there is on any state highway in two days, and that this traffic includes the heaviest of trucks.

A conference of business men, state and county officials, road experts and representatives of various interest was held recently in the Assembly Chamber at the Capitol, Albany, for the consideration of the problem of financing the state's future highway work. It is expected that the issuing of short-term serial bonds instead of 30 or 50-year bonds will result. State Commissioner of Highways Greene and former Commissioners Duffey and Carlisle were present.

Plans for the second contract for the construction of the Great Western Gateway Bridge over the Mohawk River between Schenectady and Scotia have been approved by the State Canal Board. The engineer's estimate is $663,241 and it is expected that the contract will be awarded as soon as action can be secured from the Legislature. The first contract for the work was refused by the Walsh Construction Co., of Davenport, Ia., on the ground that it would be impossible to do the work because of the rise in prices during the time betwen the reception of bids and the awarding of the contract. The Dredge & Dock Co., which bid $30,000 more than the Walsh Company has been offered the contract.

Massachusetts Highway Association

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Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston.

News and Gossip

The absorbing topic of conversation during the past few weeks in Massachusetts highway and automobile circles has been the change in the personnel of the State Highway Department through the consolidation of the old state highway board with the Commission of Waterways and Public Lands.

COL. WM. D. SOHIER

Former Chairman, Massachusetts Highway Commission.

In making the changes Governor Coolidge did ont find a place for Col. Wm. D. Sohier who has been a member of the Massachusetts Highway Commission for twelve years and chairman for seven years.

That Massachusetts roads are standard everywhere is largely due to the initiative of Col. Sohier. Nearly twenty years ago he was convinced that our road building must be revolutionized for protection against the rubber tire, and in Beverly he was making experiments—many of them for the first time in the United States—in the use of calcium chloride, of which the English magazines informed him, and in trying out here in the East the asphaltic oils which were used in California. When he went on the board in 1908 he began at once the use of maintenance methods that ever since have been employed. Massachusetts was the first of the states to build roads in sandy places by the use of sand combined with bitumen. In that same year, in experimental sections on Cape Cod, asphaltic oils and tars were mixed with sand: also gravel and stone mixtures were employed, some on the sand itself and some on old macadam base. These methods were widely noticed and now are used everywhere. Massachusetts was not the first concrete state, but the first tar-coated concrete road anywhere is at Spencer, where a road constructed in 1906 was thus covered two or three years later. And it has been used ever since. When there was no power spray in this country the commissioner brought over from England a tar-spraying machine for surface treatment, and a commission engineer, after many experiments, has invented a machine to spray heavy asphalts.

When president of the Safe Roads Association Col. Sohier drafted a law regulating the speed of motor cars and another providing for the suspension and revocation of the licenses of drivers convicted in court of certain offences. Provisions of this kind, commonplace now, were then evolved from a clear sky. England and France did not have them. By legal process to take away a license was a thing unknown elsewhere in the world. As a member of the commission it became Col. Sohier's duty to help administer the laws he had been instrumental in securing and the commission worked out a uniform automobile law which laid the foundation for the system in use in Massachusetts today It is not at all unlikely that Massachusetts is now doing more than all the rest of the states in the taking away of licenses and the blacklisting of culpable drivers There are more than 3,400 names on that list and suspensions run beyond 2,000 a year, whereas some states supend 20 or 30 licenses a twelve-month.

The motor car, of course, has made road building and rebuilding one of the big jobs of the state. Eight years ago the state was expending $600,000 in 37 towns for rebuilding roads and the towns gave $37,000 to aid; now, including federal aid, the expenditure is $8,000,000 for road work in 220 towns and the towns and counties supply $600,000. Maintenance costs have mounted from $100,000 to $2,000,000; the mileage of state highways from 600 to 1,200 and of state-aided roads built by cooperative work from 175 to more than 1,100. Especially significant is the fact that in all efforts for regulation and legislation the commission has had the entire cooperation of motor manufacturers, dealers, clubs and chauffeurs, while in other states these individuals and organizations have opposed such measures.

But the supreme achievement of the Sohier administration of the road department has been its honesty. The Colonel has played no favorites. His inspectors have not run to him to ask whether they should cancel a revocation of license because the person happened to be socially or politically prominent. He has taken away licenses from members of families of at least two governors from whom he derived his appointment. All the buying and building for the roads has been upon the same rugged basis.

The failure of the Governor to recognize Col. Sohier's long term of efficient and honest public service was a disappointment to the majority of men who have had business dealings with him during his administration, and to express their appreciation of his work and regret at his retirement they tendered him a dinner at the Boston City Club on December 17. About 200 attended, comprising men from the automobile trade, the Highway Association, the road contractors, road machinery and material interests, Massachusetts county commissioners, members of the bar, many Massachusetts city officials and the automobile editors of all of the Boston newspapers.

The keynote, as expressed by J. H. MacAlman, chairman, was, "We come to praise Sohier, not to bury him," for, because of the failure of Gov. Coolidge to reappoint him to the office, through the consolidations of the various state commissions, he was said to be "dead politically."

The honor done Col. Sohier by his friends last night testifies beyond words, the chairman said, to the esteem in which he is held by the public and the various organizations of motorists in the state

Prof. D. C. Jackson of the Massachusetts Institute of Technology suggested that Col. Sohier be given control of the Boston Elevated because of his demonstrated ability as a public executive.

Mayor Thomas Ashley of New Bedford was introduced as the "perpetual mayor." He retorted by calling Mr. MacAlman the "perpetual president of the Boston Automobile Dealers' Association." Mayor Ashley said that While Col. Sohier did not always give him the roads he wanted for his city, he always had a good reason for refusing. "This is more than I can say for the civil service commission," the speaker added. In closing he said that Massachusetts had lost a good servant, a man qualified for the position, and that every city in the state was a loser.

James S. Fortescue, Secretary of the Massachusetts State Automobile Association, speaking for the motor clubs, said every member heard with regret that Col. Sohier had not been reappointed. Wherever he is, the speaker said, he will have the good will of the motorists.

A. G. Batchelder, Executive Manager of the American Automobile Association, said that Col. Sohier was known throughout the country as the leader in the good roads movement. He described the guest of the evening as a man always ready to try innovations. He suggested that Col. Sohier would be the logical candidate for a place on the federal commission soon to be formed, to have charge of an interstate system of roads.

Day Baker, Treasurer of the Boston Commercial Vehicle Association, said that Col. Sohier had always worked for the welfare of the Commonwealth, with justice for all. Motor car owners did not always agree with him, but they always were given courteous treatment and a chance to be heard.

James W. Synan, who served on the highway commission with Col. Sohier, said the latter was the first man in Americaa to put oil on the highways right, and that he deserved the credit for starting a system of highway legislation that all other states are copying.

William A. Thidedeau, President of the American Legal Association said that Col. Sohier was a valuable public servant and that he deserved much of the credit for the state's excellent system of highways and for its motor laws.

Other speakers were James C. Poor of North Andover, County Commissioner of Essex; Mayor Arthur Adams of Springfield; R. W. Boyden, of Beverly; Charles Marden; Chester I. Campbell, Secretary of the Boston Automobile Dealers' Association, and Frank Kent of the Massachusetts Highway Commission.

When Col. Sohier was introduced the entire assemblage arose and cheered. He thanked them for their friendship and said, with emotion, that what success he had attained in life was due to such good friends as they.

Members of the Association will regret to hear of the defeat of Mayor Holmes of Worcester.

In the last city election he was defeated by Peter F. Sullivan. Mayor-Elect Sullivan was born in Ireland and has worked himself up from a newsboy's job We hope the new mayor will take as great an interest in roads as his predecessor.

Mayor Peters of Boston has been working to secure an increase in the tax rate in order to benefit some of the 10,000 city employees.

The Legislative Committee has turned down his request for a further hearing. Chairman John Hallewill refused to have the matter reopened as the committee had agreed to allow only a $1 raise

About $3,000,000 is needed and the present prospect is that only $500,000 will be available.

The Boston Chapter of the American Association of Engineers recently held a meeting in Boston. There was a large attendance and several resolutions were passed and steps were taken to secure proper recognition for engineers in city, state and national undertakings involving engineering problems.

The American Association of Engineers is composed of about 10,000 engineers, graded carefully according to their work. Its objects are to raise the standard of ethics of the engineering profession and to promote the economic and social welfare of engineers

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The City of Worcester has adopted a daylight saving ordinance which will go into effect on the first Sunday in April, 1920, and will end the first Sunday in September, 1920. Worcester is said to be the first city in New England to adopt the plan.

It does not pay to steal lanterns from street department barricades in Somerville. A young man appeared in the local court for the alleged removal of a city lantern placed as a warning at an excavation in City Square and he was promptly found guilty and given 30 days in the House of Correction.

Sand for Boston is an expensive luxury. Last year 44,000 cu. yd. were purchased for the South Boston Strandway for $26,400 It was brought from the South Shore and spread along the bathing beaches Today it is difficult to find any of it with a microscope, unless one pursues his investigation into the homes of South Boston, the manufacturing plants, sewers and hedges. The sand was literally blown away by the ton. Chief John E. Carty of the bridge and ferry service says a ney layer would cost the city $110,000, for the price of sand has gone up like that of other things. The city is not likely to buy until prices drop

(Continued on page 269.)

New Hampshire Goods Roads Association

OFFICERS FOR 1919

FREDERIC E. EVERETT, President	Concord
WINFIELD M. CHAPIN, First Vice President	Keene
HARRY L. SMITH, Second Vice President	Lakeport
W. B. HOWE, Secretary and Treasurer	Concord

Board of Directors

O. F. WINSLOW	Nashua
C. M. BROOKS	Keene
H. W. SPAULDING	Manchester
ALFRED CLARK	Concord

The regular quarterly meeting of the New Hampshire Good Roads Association was held at Tilton, on Thursday, Dec. 11.

W. C. Wyatt, Chairman of the Board of Selectmen, delivered an address of welcome to the members of the association and their friends. This was followed by a paper read by O. F. Winslow, and entitled, "Concrete Pavement vs. Bituminous Pavement." Chairman Lewis Case of the Cement Dealers' Association spoke in the interest of concrete roads, and for the bituminous pavements A. L. Rhoads and Mace Moulton, Jr., spoke for asphalt construction. Charles Needham spoke for tar roads and gave a very interesting speech covering local conditions and describing the extensive use of tar throughout the State of New Hampshire. At the conclusion of the discussion it was unanimously agreed that Mr. Winslow's views were very fair to all.

At 1:30 dinner was served at the Ideal Hotel, about 50 members and guests being present. Unlike previous meetings there was no discussion during the dinner.

After dinner the meeting adjourned, at 3:15 p. m., and returned to the Selectmens' room. William Lang informed the members of Frank Neal's wedding and advised the members that for the present Mr. Neal would reside at Merideth, N. H., on the main trunk line, a spot which is very well known to most of the members. Mr. Neal expects to be back in his office shortly before Christmas.

Applications were received and accepted for 10 new members which makes the total membership now 275. It it hoped that at least 25 new members will be admitted at the annual meeting to be held in Concord on the second Thursday in March. The new members are F. L. Drannen, City Engineer, Berlin, N. H., A. H. Gardner, State Highway Department, Keene, N. H., W. N. Prescott, State Highway Department, Keene, N. H., J. B. Wright, State Highway Department, Keene, N. H., A. H. Kittredge, Albany, N. Y., H. D. Wells, Concord, N. H., F. B. McGrane, Somerville, Mass., P. B. Bristow, Boston, Mass., L. C. Chase, New York, N. Y., Hon. John A. Mitchell, Mayor, Laconia, N. H., A. O. Brown, Manchester, N. H.

The following members were appointed on the nominating committee, to arrange for nominating candidates to be balloted on at the next meeting: O. F. Winslow, W. B. Howe, E. F. Durfee, C. M. Brooks, C. A. French.

An open forum is to be held during this week in the lecture room of the Arts and Sciences Institute at Manchester under the auspices of the Association of New Hampshire Assessors.

Invitations have been sent to the mayors of the eleven cities in the state and the following officials have expressed their intention of being present: Mayor Crowley, Nashua; Mayor Hyslop, Portsmouth; Mayor French, Concord; and Mayor-Elect Burque, Nashua.

The principal speaker of the evening will be Prof. J. P. Richardson, head of the Department of Political Science in Dartmouth College. Prof. Richardson for many years preceding his acceptance of the position of head of the department at Dartmouth was a practicing lawyer in Boston. He has made a special study of the legal phases of financial and taxation problems and his address on current tendencies in this highly technical field will be full of information for those genuinely interested in the matter of taxation.

A special invitation is being extended by the association of assessors to everyone thoroughly interested in the problems relating to finance and taxation to attend the meeting. Prof. Richardson has spoken in this city on two or three previous occasions and his appearance has always been looked forward to with deep interest. It is expected that a capacity audience will be on hand to greet him.

A new motor truck line has been established between Manchester and Boston The trucks will leave Manchester on Monday, Wednesday and Friday, returning from Boston, Tuesday, Thursday and Saturday.

The line will be operated on the return loads system so that capacity loads will be available in both directions.

The motor equipment consists of two 4-ton trucks with rubber tired trailers, both vehicles being equipped with high box bodies with canvas covers. The total load carried by each truck and trailer will be about 6 tons.

Governor Bartlett has signed the bonds to cover payment of a $70 bonus to each service man or woman who entered the war from New Hampshire.

The delay in opening the new state highway bridge at South Merrimack has caused much trouble for vehicles on account of the bad condition of the detour that was provided

On account of recent heavy rains it was practically impossible for any automobile to get through the mud and a team of horses was busy during the entire day helping machines, at one dollar per ton. The drivers of the motor cars preferred paying this to taking a chance on a 4-mi. detour where in places the water and mud were over the running board of an ordinary pleasure car.

The Reardon personal injury case against the City of Manchester is now before the Board of Aldermen for settlement

The plaintiff's atorneys claim that the injury was due to a collision between two trucks operated by the Public Works Department, through the negligence of the city's employees.

Reardon has just been discharged from the hospital after spending two years and ten months in the institution on account of the injuries received.

Although the farmers of the state are solidly opposed to the return to daylight saving, the Concord Board of Trade is taking steps to bring the matter before the various commercial bodies in the state for consideration.

There has recently been a conference at Portsmouth of the engineers of the bridge commission, including Capt. E.

H. Brownell, L. B. Jones, and W. A. Grover. Plans and models of bridges were under consideration and it is expected that a definite policy will be decided upon within two weeks

The principal difficulty is in determining what type of structure can be built for $1,500,000. The final estimates and the decision as to the plans for construction rest with Commissioners Daniels, Milliken and Bartlett.

The important matter of examining the locations for pier and abutment foundations will soon be started.

In passing through Milford at the South Street railroad crossing meet Daniel Mahoney, gate tender. Mr. Mahoney has just completed 47 years on his present job and during this time he has never missed a day from his work. He goes to bed at 7 o'clock every evening and gets up at 4 a. m. He has never been to a dance, a theater or a movie show and has yet to take his first ride in an automobile. Can you beat it?

The fourth division of New Hampshire state highway patrolmen recently held its annual meeting at the City Hall in Keene. Many questions pertaining to road maintenance were discussed and the questions of special rights for road patrolmen were considered. The law now permits them to stop their teams or motors on the left side of the road while at work, if necessary, leaving room for traffic to pass on their right. Arthur Russell who works with Treasurer Fogg in banding poles, painting guard rails, signs, etc., was elected an associate member. In this connection it may be remarked that division 4 installs and maintains its banding system and general and cautionary traffic signs very much better than is customary on the other highway divisions—a function of prime importance to the traveling public as well as an indication of thoroughness in the division work.

Dinner was served in Widely Hall at 1:30 and the speakers included Mayor Watson of Keene, Mr. Goodnow, City Councillor, Speaker C. W. Tobey of the New Hampshire House of Representatives, and Editor Hazeltine of the "Keene Sentinel."

Officers were elected for the ensuing year as follows: Henry C. Mosher of Marlow, President; O. D. Bageley of Peterboro, Vice President; C. H. Robinson of Marlboro, Secretary, and H. D. Fogg, Treasurer.

The City of Manchester is experiencing an upheaval in its Public Works Department on account of the resignation of Director Samuel J. Lord, who has been connected with the department for 22 years. He was first elected city engineer in 1898. He remained in that position until 1907 when he was elected a member of the Street and Park Commission. He served in this capacity until the Board was abolished in 1917. During that year the Board of Public Works was created and he was made director, from which position he has just resigned.

Michael F. Shea who has been appointed to succeed Mr. Lord is a former state senator and prominent in Democratic political circles of this city. He is an attorney at law and has made many friends throughout the state because of his ability to handle the many problems which have been put up to him.

Since the announcement of his appointment Mr. Shea has been congratulated by his many friends all of whom wish him success in his new undertaking.

News and Gossip

(Continued from page 267.)

At the city election in Boston last week the voters approved of the slicing of the Common to widen Boylston and Tremont Sts. The plans for the work are completed but the changes will not be made until next spring.

The City of Quincy thinks it has cause for congratulation. It has actually received money—real money—from the commonwealth instead of giving it up to the state. And furthermore, the state has "come across" voluntarily

The amount of the contribution was $5,155.51.

Some time ago the state borrowed money for the erection of a bridge across the Neponset River, connecting Boston and Quincy. Part of the amount was levied on Quincy, but owing to a combination of circumstances, chiefly relating to the war, the money was not spent.

The sum was earning interest all the time, and when the interest grew to a size where it warranted an apportioning, State Treasurer Burrill thought it only fair to distribute it among those places assessed for the cost of the bridge.

That's how the State of Massachusetts played Santa Claus to the city of Quincy.

It is the hope of Mayor Charles W. Eldridge of Somerville and Mayor Benjamin F. Haines of Medford that the winding, crooked, squirmy, meandering Somerville-Medford line will be straightened out by act of the Legislature, according to notice served on the Secretary of State yesterday by the two city chief executives

Mayors Eldridge and Haines, acting in unity, served formal notice that they would file a bill with the coming Legislature to change the boundary lines of the two municipalities, the change to "give and take" so far as territory is concerned

Many jokes have been made in the past about the boundary line between the two cities. Streets wind in and out of the two places in the most amazing manner. Boston Ave., for example, starts in Medford, runs through a portion of Somerville and ends up in Medford There are residents of Somerville whose houses are in Somerville, but whose front yards are in Medford It is hoped, Mayor Haines said recently, to correct these topographical irregularities if the members of the coming Legislature see the light as do many of the residents of Medford and Somerville.

The failure to appoint a registrar of automobiles in connection with the reorganization of the Massachusetts State Commission leaves one of the largest departments in the commonwealth without a permanent head.

Col. A. F. Foote, of Holyoke, is now acting head of this department and is doing excellent work but the department should have a regularly appointed head at once and many hope that Col. Foote will be the man selected. He has been connected with the Highway Commission since 1907 and is thoroughly familiar with the work

The importance of this department is shown by the annual receipts. In 1918 the total was $2,184,408, with an increase to $2,667,853 in 1919. On Dec. 1, 1919, the advance payments on 1920 registrations amounted to $515,601.

Governor Coolidge has received a petition signed by more than 500 state employees, asking that the salaries of their fellow workers and themselves be increaesd.

A 40% advance is requested for those now receiving

$1,200 or less and one of 25% for those receiving between $1,200 and $2,500. The petitioners state that unskilled laborers are in many instances being paid better salaries than are many state employees, although the latter have been required to take special training and to pass civil service examinations in order to secure appointments.

MEETINGS

Calendar of Coming Meetings

Jan. 15-16, 1920—Southern Appalachian Good Roads Association—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Jan. 29, 1920—National Highway Traffic Association—Annual convention, International Amphitheatre, Chicago, Ill. President, Arthur H. Blanchard, University of Michigan, Ann Arbor, Michigan.

Feb. 9-13, 1920—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Apr. 12-17, 1920—United States Good Roads Association.—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Apr. 16-17, 1920—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

American Road Builders' Association

The assignment of exhibition space at the Eleventh National Good Roads Show to be held under the auspices of the American Road Builders' Association in connection with its seventeenth annual convention has been commenced. As has been noted, the show will be held at the Jefferson County Armory, at Louisville, Ky., on Monday, Tuesday, Wednesday, Thursday and Friday, February, 9-13, inclusive.

Some 50,000 sq. ft. of floor space will be available for the displays of road machinery and materials and the like. This area has been divided into spaces of convenient size and shape, many of them with aisles on two sides. For the past two years the show has been curtailed because of the war For that reason and because of the enormous sums to be spent for road work in the near future, a record breaking show is expected.

Conference on New York State Road Work

A conference on highway work in New York State was held in the Assembly Chamber at the State Capitol on the afternoon of Wednesday, Dec. 17. The meeting was called by Governor Smith and was attended by state and county road officials, business men and others interested in road work and prominent in public life. The chief subject of discussion was the financing of the state's road work. State Highway Commissioner Greene's policy of building so extensively of cement concrete also received considerable attention and was severely criticized by several of the speakers.

A proposal that the state adopt a "pay as you go" policy in the construction of its highways was laid before the conference by Commissioner Greene. In the past the state has met the cost of road building by the issuing of long-term bonds. Commissioner Greene pointed out that a $100,000,000 issue of 30-year bonds would mean an expenditure of about $190,000,000 by the end of the bond period, or nearly double the amount actually put into the building of the roads. He said that he believed that a "pay as you go" policy would be more businesslike and more economical.

Senator Henry M. Sage, of Albany, Chairman of the Senate Finance Committee, urged economy in state expenditures. He pointed out that the budget was growing each year and urged that something be done to stop it. Six years ago, he said, it was $60,000,000; last year a $95,000,000 budget was passed, and this year the amount asked is $143,000,000. The state's income according to Senator Sage, is estimated at $120,000,000 for the coming year, and every means of raising money by indirect taxation has been exhausted and to increase the revenues it will be necessary to either put another direct tax on real estate or increase the rate of the state income tax.

Several speakers took issue with Commissioner Greene on the proposal to adopt a "pay as you go" policy, among them Peter G. Ten Eyck, former senator and formerly regional director of the Highways Transport Committee, J. Duncan MacInness, representing Comptroller Craig of New York City, Cornelius F. Burns, Mayor of Troy, and John A. Guider, Commissioner of Public Works of the Borough of Brooklyn, New York City. The general sentiment of the conference, according to reports, seemed to be for the issuing of short-term serial bonds instead of 30 or 50-year issues.

Among those who attacked Commissioner Greene's policy of building cement concrete roads were Former Commissioner of Highways Edwin Duffey and State Comptroller Eugene M. Travis. Mr. Duffey contended that there are certain roads that do not require cement concrete pavements and that the people generally do not want $40,000 a mile pavements. Comptroller Travis said that it was not certain that concrete highways should be built in all sections of the state.

PERSONAL MENTION

Al. Williams, of Ionia, Mich., has been appointed county engineer of Ionia County.

F. H. Fretto has been appointed resident engineer on federal aid road work in Labette County, Kansas. Since his discharge from the army, Mr. Fretto has been connected with the testing department of the Kansas Agricultural College.

Rollen J. Windrow, State Highway Engineer of Texas, has been granted an increase in salary of $4,000. It is understood that he was appointed with the understanding that if his services proved worth $10,000 annually, he was to be given that salary at the end of six months and that if they were not he was to resign. He started his work at $6,000.

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NEW YORK, DECEMBER 31, 1919

Number
27

Roads in France and America*

By MAJ. E. A. KINGSLEY†

People generally seem to be of the opinion that France is a country of automobiles. Tourists returning with empty pocketbooks spin wonderful yarns of automobile trips through the Vosges Mountains, the Alps, or along the Mediterranean Coast. They tell of the wonderful roads to be found in every section, connecting every hamlet. These same splendid roads have for years been held up as models to engineers.

It was the writer's privilege, during seventeen months of the American occupation of France, to be in charge of the maintenance of several hundred miles of these roads. Some of them were built on the same foundation soil used by Caesar in his conquest of Gaul. Many a day our car traveled the same route over which the great Napoleon led his hosts to victory. We have entered Paris over the identical road taken by the conquering Wilhelm I, in the year 1870. Truly they were good roads.

But France has not been an automobile country. Tourists have well nigh been the majority of the few traveling by motor. Outside of the district of Paris, and a few of the larger cities, automobiles have been rarities. Usually the tourist started his journey from Paris, where he secured a car. At the end of his journey his car returned to the Paris garage. Paris was the automobile center of France. Few, even of the Paris cars, ever reached farther than Fontainbleau.

Automobiles were an expensive luxury. Gasoline was even more expensive, and the combination was almost prohibitive. French cars were largely of the luxurious vehicle type for the wealthy class. In consequence of this, French roads were maintained with no regard for automobile traffic. They were magnificent roads, but essentially wagon roads.

That France is a country of communities is the basic reason for the excellent condition of its road system. In the centuries gone by, railroads were unthought of. A chateau was built on a hill for the better protection of its owner. His vassals settled around, with castle and church in the midst. Often there surrounded the settlement a stone wall. There were practically no isolated settlements, the cultivated lands surrounding being worked by toilers from the settlement.

Centuries rolled by and the country was settled. New methods of warfare made obsolete the walls, but the disposition to live in communities remained with the people. To-day, views from the tops of the many hills do not show, as in America, homes dotting the landscape, but little towns and villages on the hillsides and in the valleys. In the early morning, peasants, with almost every form of vehicle, may be seen leaving the settlements with crude implements to till the fields. At nightfall the procession is reversed.

Undoubtedly, dwelling in communities has done much to require good roads in France. Every farmer is an every-day user of the roads, and it has taught him the absolute necessity of good roads all the time. His soil is largely clay, and the climate is wet. This combination does not produce good natural roads. Consequently, the Frenchman is always a booster demanding paved roads.

The French road system is under the direct control of the Department of Public Works. Both construction and maintenance funds come from the state treasury. In general, the roads are of two classes, national and departmental. The national roads are all through roads, connecting by short lines the larger centers of population and ignoring department lines. Departmental roads are those more closely identified with the department in which located. French departments are political divisions of government, nearly corresponding to our counties. Departmental roads are again divided into first class, second class, and neighborhood roads.

Whenever a route is shown on a French road map, a paved road may be taken for granted. The national and the first class departmental roads are wide and well built. Second class departmental roads are somewhat more lightly built, and the neighborhood roads are narrow and lightly constructed. All, however, are well paved roads.

Practically all construction is of the water-bound macadam type. From the chalk coast cliffs to the border mountains lie vast deposits of lime rock, of varied degrees of hardness. In a number of interior communities good granite is found. In others there is volcanic rock; while trap may be had in the Vosges. Limerock predominates, though, in every section, and has been generally used in road construction.

French macadam roads are constructed much like our own roads. The great depth of metal and carefully laid Roman blocks of stone are largely mythical. Their macadam roads are modernly built of crushed stone. In wet sections of bad soil, often a Telford base is laid, but even Telford is usually missing. Prof. Blanchard's macadam specifications, adopted by our society as standard, will produce just such roads, if followed, as are found in France.

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*Paper presented at the 25th annual convention of the American Society for Municipal Improvements, New Orleans, La., Nov. 11-14, 1919.

†Superintendent of Roads, Intermediate Sector, A. E. F., Jan. 1918, to June, 1919; Past President, American Society for Municipal Improvements.

Several reasons exist for the uniformly good macadam. The initial reason is care in construction. The material, after being placed, is rolled thoroughly, most of the rollers weighing 18 tons. This produces the desired compression. Water is also used in sufficient quantities to soak the road. Too many of our contractors seem afraid lest water will wash the rock away.

Another first principle not overlooked is drainage. Big ditches are dug paralleling the road and cross drains cut and kept open to these side ditches. Thus the surface water is taken and kept from the road. Culverts and bridges are made sufficiently large to carry off the water and of such permanent construction that renewal is not necessary.

All roads before the war were bordered with at least one row of trees on each side, and often there were two rows. Not only did this add to the beauty of the road, but the trees served to produce shade and retain moisture in the ground. When timber and fuel became scarce during the war, thousands of trees in every department were cut down to produce lumber and firewood.

The patrol system of maintenance is universally used in France. The same officers are kept in charge year after year. Only a promotion, resignation, or removal for incompetency makes a change. The post of a supervisor is also considered one of honor. He is recognized in the community as a man of standing. His authority in matters concerning the roads is supreme, and his decrees must be obeyed. Supervisors are proud of their positions and jealous of their authority. On one occasion it became necessary for the writer to correspond with one of them in regard to some work being done in his section by the American Forces Not realizing the importance attached to the office held by him, our letter was addressed in good French style

"Monsieur Chambon,
Fours (Nievre) France."

Fours is a very small town, and Chambon, being well known, received his letter next day. A few days later he called to discuss the matter. Just before leaving, he produced the envelope which had carried his letter to him and showed how it had been addressed. He then carefully explained his official title, requesting that in the future we be sure to use his title, "agent voyer," on all corespondence.

This incident is not told as a joke. Chambon, not unlike all such officials, was proud of his office and wanted his title used. His position was one of recognized importance. It was because of his application to duty that he succeeded. And it is because of respect for him and his position by the people he serves that he is able to accomplish so much. The French people have learned that good men must be retained in these positions to obtain good results, so the positions are made those of merit and honor. Tenure of office does not depend upon a political turn of the wheel and the positions are sought after and filled by competent men.

The fact that automobile traffic has not been heavy in France and that material has been abundant has made macadam almost the perfect road. Material and labor for both construction and maintenance has been plentiful and cheap. The climate, too, being generally damp, has been an aid. Slow moving ox carts and big horse-drawn wagons tend to further compact the surfaces. A little rock added here and there is crushed and rolled, making continually a new surface. Thus a good, smooth surface is always maintained.

In some parts of France, before the war, a little surface treatment was used. Outside of Paris many miles of macadam were treated, with good results. Tar, being plentiful, was coming into general favor. French road and bridge engineers realize that their main highways will be called upon to stand the new and rapidly increasing automobile traffic. The water-bound macadam is giving way, but ready money for satisfactory new surfaces is not forthcoming. Surface treatment, having been successful in a small way, offers the quickest remedy for road preservation. The light treatments are but temporary remedies on the heavy traffic roads, but they will serve the purpose for a few years. In the meantime France will be able to readjust her finances and then new surfaces can be laid upon what will be most excellent foundations. Within the next few years, undoubtedly thousands of kilometers of good American pavements "patented or otherwise' and with plenty of "inherent stability" will be laid on French roads.

In the cities and small towns and a few highways near Paris, limestone blocks have been used. Invariably they are laid without other foundation than sand or gravel. When well drained and not subjected to very heavy traffic, these pavements wear well. But under heavy truck traffic and the damp climate conditions, they become rutted, uneven, and oftimes very rough.

An exceedingly interesting phase of French highway construction and maintenance is the attention paid to the aesthetic. Not only are the roads carefully laid out to obtain the greatest scenic advantage, but graceful curves and splendid lines are used. Trees are set out carefully as to alignment, and are kept well trimmed. Berms are well sodded and the roadway at the grass edge is kept neatly trimmed. Stone piles along the roadside and piles of debris are shaped up and carefully trimmed. Ditches are squared and kept clean and open. In fact, nothing is left undone to make the roads beautiful and attractive. Every kilometer is marked with a neat, carefully set stone. The kilometer stones are all marked with the road number, initial and the stone number on the face, and distance numbers on either side. Every 100 meters is also marked with a small, plain stone, bearing on its face the number of the 100 meters from the last kilometer stone. Intersecting roads are marked with metal signs. These are neatly made and are carefully set, plainly showing the route initial and number, and the directions to be taken. In the cities and towns, larger signs are also placed in conspicuous positions along the various routes. These, in addition to general directions, carry the names of the town and the department.

In America, railroads have played a larger part in our development than highways. West of the Allegheny Mountains, this is especially true. During the early days of our government, however, the need for "wagon roads" was recognized. Thomas Jeferson first took the question up, inaugurating a system of national roads. Congress passed an act in 1803 providing for the building of the first national road, but an appropriation was not made until 1806. Construction was begun at Cumberland, Md., in 1810, but Wheeling, W. Va., was not reached until after the close of the war of 1812. Columbus, Ohio, was reached in 1833, and Indianapolis in 1840. But nearly a half century elapsed before the road was completed to the banks of the Mississippi at St. Louis. The National Road became a well known artery of traffic from East to West, and has ever since its construction been maintained and known as "The National Road."

Horace Greeley's famous dictum, was "Go West, young man, go West!" Before Greeley's time, though, hundreds of thousands from east of the mountains were moving West— to the then "Far West," Ohio, Indiana and Illinois. In later years, other millions took up the trail, still moving west from these states to the river crossing, and from there scattering over the great western plains.

The country was new and land cheap. Tracts of enormous area were taken and settlements made, not in towns and villages, but on vast estates, with homes widely separated.

This meant not many miles of roads but many thousands of miles, if wagon traffic were to be the method of transportation.

Then came the railroad! Road building was forgotten by Congress and every effort was made to improve and extend the railroad lines. In the great, unsettled West great empires were given to corporations that would build railroads. In consequence, after the war between the states, railroads and not wagon road became the arteries of traffic. Railroad stations, villages and towns were planted at points more or less convenient to the settlers. The railroads brought in new settlers and provisions and equipment for old and new. Railroads, too, hauled away and harvested crops. Farmers became accustomed to hauling to and from the railroad stations, and this was all the need for roads.

In most of America, the climate provided long, dry spells, and the farmer utilized the long summer and fall for hauling, or he could wait until the ground was frozen in winter. In dry weather or in cold winter weather the dirt road was satisfactory. In wet weather he could not use the road, but the American farmer became satisfied with conditions. The Government was building railroads and the farmer saw no necessity for anything better than a graded dry-weather road to his railroad station. Road legislation then ceased entirely and for many decades road building was a question of clearing and grading and building the necessary wooden culverts to care for drainage.

Roads are the outgrowth of necessity. French roads were the outgrowth of a necessity dating back to the time of Caesar. The national road was required because settlers from the Atlantic Coast country desired to go west into the wonderful unsettled Mississippi Valley country. Thomas Jefferson realized the urgent need of a great thoroughfare across the mountains and into the heart of the new country, and he fathered legislation and took steps necessary to build it.

The country settled slowly and was financially so poor that for many years the National Road was the only through road. The building of railroads further impeded progress in road construction, as the settlers believed that railroads would take entirely the place of wagon roads.

Not until long after the war between the states did road building again become popular. In the 80's of the last century the bicycle came into vogue, and the famous (in those days) L. A. W. (League of American Wheelman) became the pioneer good roads organization. Most bicycde trips were limited to a few miles, and a trip of 50 mi. was wonderful. Then, too, the bicycle was a dry weather plant, and graveled roads were the acme of perfection.

The agitation for better roads came earlier in the East, because of more thickly settled conditions. Railroads were beginning to feel the effects of thickly settled communities and better road conditions were being little by little demanded. New Jersey pioneered in 1891 by offering a bounty of one-third the road construction costs to the township or county as an encouragement for building "good, permanent roads." In 1893, Massachusetts passed a law providing for three-fourths of such cost, and in 1895 Connecticut agreed to defray two-thirds of her construction costs. New York, in 1898, passed a state aid law, and other states east and west, have followed, until today every state in the Union has a state highway department, aiding road building from state funds.

While this change was gradually taking place in the East, the last 20 years of the 19th century witnessed such an era of railroad building in the West and Southwest as had never been dreamed of. Wagon roads were neglected, but railroads, necessary and unnecessary, were built everywhere. Millions upon millions of dollars were wisely expended and foolishly wasted. The East built gravelled roads, but the farmer of the West did not want roads. He held the balance of political power, and the West did with dirt roads, and often with no roads.

In 1893 appeared the first successful automobile. This apparent curiosity was soon developed into a cumbersome, noisy luxury. Other automobiles were perfected, and the machine reached a stage of usefulness. This has rapidly been widened and developed until today the automobile has become an absolute business necessity.

Automobile traffic required heavier roads. The dirt roads full of "chug holes" and with broken down and stopped up wooden culverts would not carry the traffic. The American Automobile Association was organized and began its educational campaign. The farmer fought it as he fought snakes when he cleared his land. Automobiles frightened his horses, broke through the culverts, rutted up soft roads, and created clouds of dust in their pathways. They were a luxury for the rich only, and a pest and nuisance to the farmer. No money would be voted for roads because only the hated automobile would benefit.

In the meantime, the Government at Washington had created a road department, and this department joined with various associations to educate the people. Slowly this sentiment grew. The states of the East began to build better roads of gravel and water-bound macadam. Slowly the states West and South followed this example. Automobiles were not plentiful and the gravel and macadam roads became the standards of excellence. By the time the 20th century was 15 year old, thousands of miles of this kind of road had been built. It is estimated that at the end of 1918 there were some 200,000 mi. of water-bound macadam and gravel roads in the United States.

During the past ten years, the United States has enjoyed a period of unprecedented prosperity. There had been periods before when the farmer had done well and when the manufacturer had made money. But during the past ten years all have prospered. This resulted in over-taxed railroads and poor service. Other methods of short-haul transportation were sought for. Merchants and manufacturers in the thickly settled northeastern districts turned to motor trucks. Little by little the truck was adopted, and gradually the hauls were lengthened. Farmers of those sections became interested in truck deliveries to them. They found a great convenience in the use of trucks as well as a big saving of money and time.

Increasing prices and enormous crops in the West made moneyed men of the farmers. With their country banks almost bursting with deposits, they have been converted. Almost every farmer of the Middle West now owns an automobile — or a Ford. He has become a veritable friend, and conditions have reversed as to the desire for roads. The West is now in the lead. More money evidently has been voted for roads in Texas, Arkansas and in the Middle West than in any other part of the country.

The automobile, though, has done more than reverse the sentiment as to road building. It has created new conditions. In France, before the war, the famous macadam roads answered every purpose. Now new construction methods are necessary, largely because of the increasing auto traffic. So in the United States new methods for the main traffic roads have been required. New Jersey, with its thousands of miles of macadam, water bound and treated, must spend milions to save what has been spent. Thousands of miles in New York state must quickly be cared for or millions of dollars spent will have been lost. So runs the story over the country. Twenty thousand miles of gravel and macadam in Texas must be cared for.

Our problems are not now different from those of France. Water-bound macadam will not stand the heavy modern traffic of our main highways. Pavements similar to those laid in our cities must now be built. The highway engineer of today must be not only one who can lay out his road, plan and fix his lines and grades, but he must be an engineer versed in the highest art of pavement construction. He must deal with asphalt, with brick and with Portland cement concrete. Heretofore, the county engineer, if he had ability, could in time become the city engineer of some small town. Now the ambitious city engineers of the larger towns and cities reach one step higher in their careers when they become county engineers. In the days gone by, the Civil Service Board at Washington graded down the applicant for position of senior highway engineer if he dwelt upon his ability as a city engineer and paving expert. Now applicants are told: "Additional credit will be given for experience in the construction of cement concrete, brick and bituminous types of surfaces."

In by far the major portion of the West, new construction is required. One county in Texas, has voted $4,500,000 for new road construction. Not a foot of old road is to be resurfaced or reconstructed. The engineer will have only new construction problems with which to deal. These conditions require study by the engineer as to what of the various forms of paving are best, under the circumstances, for his road conditions. But his work is from the ground up.

The eastern states, and not a few sections in the West, present many different problems. Thousands of miles of good macadam roads, at an expenditure of millions of dollars by the taxpayers, have already been built. Modern auto traffic is rapidly wearing them away. Available funds for new construction are insufficient. So much new work is to be done that a serious problem confronts the engineer. It is the same old question of spreading the butter sufficient for one slice of bread over two.

In December, 1918, Messrs. Tillson and Lewis went to France that they might study French road conditions for the benefit of both France and America. Their findings, with their recommendations, are very valuable to American highway engineers. They may be a little disconcerting to those promoters who are so incessantly working for the sole interests of those who pay their salaries and expense accounts, and who practically disregard the needs of the community. But the recommendations are splendid for the engineer who has been endeavoring to find a way to utilize the old macadam and save to his constituents as much as possible of the results of expenditures made in past years and before his time.

"Sometimes," reads a portion of the Tillson-Lewis report, "when a water-bound macadam pavement has been laid for some time, a thin coat of bituminous material is spread over the surface. It has been used to quite an extent on light traffic roads with good results." Why tear up good macadam when, with a bituminous surface treatment so many of our roads may be preserved for years?

Again, the Tillson-Lewis report reads: "Happily, most of the French roads will make excellent foundations to which it will be sufficient to apply appropriate wearing surfaces." No hint or suggestion is made as to tearing up the old macadam that it may be replaced with an expensive foundation for the "appropriate wearing surfaces." No more is there necessity in many, many instances in our own country for tearing up well built gravel, water-bound macadam, or even bituminous surface-treated macadam to put in new foundations. Thousands of dollars per mile upon thousands of miles of thoroughfares can be saved to the property owners by intelligent use instead of destruction of the work already done and expenditures already made.

The writer, to conserve a fast disappearing city bank balance, in 1916, paved several streets in San Antonio, Texas, by using as foundations old macadam roads. The macadam was made perfect in surface, after which a 2-in. asphaltic pavement was laid. No defects have been noted in any of this work, and much pavement in San Antonio has since been laid in the same manner. Some of the older of these pavements are in the downtown district and subjected to considerable heavy traffic.

Mr. George C. Warren, before our Newark, N. J., convention in October, 1916, presented an excellent paper on "The Passing and Conservation of Macadam City Streets and Country Roads." I do not know whether this paper has been "pamphletized" by the Warren Bros. Co., as is their custom regarding good papers of the kind. I do know, however, that copies of the Warren paper and the Tillson-Lewis report should be in the hands of every highway and municipal engineer.

The various material associations can be to us, and have been, powers for good. The National Paving Brick Manufacturers' Association has done splendid work, and Mr. Blair has stood at all times for the very best. The Portland Cement Association has in its service some of the best engineers in the country, and its cement paving specifications are always kept ahead of the standard. The men at the head of the new Asphalt Association—Pennybacker and Hubbard—assure us that this association can be depended upon by the engineers. All of these associations do a vast amount of research work that is available to the engineer, and he can profit by conferring with the association men.

The dangerous man for both engineer and community is the promoter who attempts to urge his material, regardless of conditions, to the exclusion of every other material. Cement concrete is not desirable nor required where a macadam road is built and will answer for foundation purposes. And yet there are many cases where the macadam will not answer and concrete foundations should be used. The promoter whose sole aim is to sell cement is a poor man to allow to make a decision. Then, too, it is poor policy, except as a temporary expedient, to treat with a light bituminous surface a road known to be subjected to extremely heavy traffic. It is mighty poor judgment on the part of an engineer to recommend paving with brick when the cost of freight and handling force brick prices to such a high figure as to materially reduce the mileage of construction. Other pavements can successfully be used.

In the end, the highway engineer must be the sole judge as to the necessities of the case. It is unfortunate that politics, to a degree, still enter into such work. The cooperation of state and national bureaus is rapidly relegating political influences. Engineers are being more and more depended upon for opinions. The engineer, then, must be competent to judge and select, considering all conditions, the pavement needed. It is he who must say whether macadam is satisfactory for a foundation or whether traffic, instead of the promoter, demands a concrete foundation. The intelligent, wide-awake engineer can usually convince his constituents that he knows what he is about. It is estimated that $800,000,000 has already been spent in the United States on water-bound macadam and gravel construction.

The engineer will be called as the doctor on these roads. He is the one who will have to diagnose the case and prescribe the remedy.

A very large proportion of this expenditure can be utilized by the intelligent engineer. The Tillson-Lewis recommendations for France are applicable to America. Cement salesmen can find sufficient outlet for their efforts in new construction. The hundreds of millions saved by utilizing good macadam for foundations will build thousands of miles of additional roads so badly needed in America. In France, there is not a village or hamlet which cannot be reached from every other part of France over a paved road. In America that day will come the sooner by conserving and utilizing what we have already built.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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E. L. POWERS
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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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FRENCH ROADS

References to the "wonderful French roads" have been very common for some years past and there has gradually grown up—at least in some quarters—an idea that France is a country crossed and recrossed by wide, straight, smooth roads, paved with some enduring material, bordered by stately trees and so well cared for that defects can never develop. It has been more or less the fashion to compare these roads with our own, to the detriment of the latter, and, as a natural corollary, to infer that the French highway engineer is several steps ahead of his brother engineer in America.

On several occasions we have printed articles accurately describing French roads and French road construction and maintenance methods, and more than once we have used these columns to call attention to the erroneous impressions of the road system of France acquired by American engineers and others. Once more we wish to direct attention to the matter, this time by recommending the reading of the paper, "Roads in France and America," presented at the 1919 convention of the American Society for Municipal Improvements by Maj. E. A. Kingsley, and printed on other pages of this issue.

In his paper, Maj. Kingsley drew an accurate picture of the roads of France as they were at the outbreak of the war. For the most part, as he pointed out, they were water-bound macadam roads very like those that were being built so extensively in this country when the growing use of the automobile necessitated the development of other types of surfacing for the more heavily traveled routes. Whatever superiority they possessed over American roads was due to two causes—the very small amount of motor traffic they were called upon to carry and the painstaking maintenance work that was done on them. In other words, the macadam roads of France were good chiefly because that country was considerably behind this in the development of traffic and to some extent because it was ahead of this country in the application of maintenance methods thoroughly understood by the highway engineers of both countries. The first was largely due to the relative wealth of the people; the second was mostly a matter of temperament.

But with all the attention paid by French road authorities to the care of their roads, and in spite of the lighter traffic the roads of France were called upon to bear, the best French roads were never better than the best American roads, though it is true that many visitors from this country came back from France holding the opposite view.

RESOLUTIONS OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS

The resolutions adopted at the recent meeting of the American Association of State Highway Officials should possess special interest for every highway engineer, because it is reasonable to assume that they represent the opinion of the men in responsible charge of the greater portion of the important road work in the country.

Much ground is covered by the resolutions, which are printed on other pages of this issue, but a very considerable portion of them refers to the general subject of participation by the Federal Government in road work in one way and another. These are especially interesting, since they are the views of the men who have had the most experience with the workings of the present Federal Aid Law and who are presumably the best judges of what is needed in the way of modifications or amplifications of the existing statutes.

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Montana Has Available for Road Construction a fund of $11,755,000, including the federal appropriation of $5,500,000. Nearly all of this fund is to be spent on federal aid roads.

Residents of Linn County, Oregon, are manifesting unusual interest in road betterment, according to recent reports. Although the county has voted to issue $600,000 worth of road bonds, there will be a 2½-mill county road levy and 16 of the 35 road districts are to vote on special road levies.

Good Roads are Numbered among Present-Day Evils by a small-town pastor in Ohio, according to a recent report. Ascribing the small church attendance to automobiles and good roads, he is reported to have said: "I will thank the Lord when roads become so bad that Sunday auto touring will no longer be a pleasure."

Street Work Done in Springfield, Mass., during the past year included the laying of 2.5 mi. of sheet asphalt pavement, 0.5 mi. of asphaltic macadam and 1.5 mi. of tar macadam. In addition, 4 mi. of water-bound macadam streets were resurfaced with tar macadam; 8 mi. of gravel roads were surface treated with tar and sand; 28 mi. of gravel roadway were surface treated with asphaltic oil and sand; 8 mi. of water-bound macadam streets were surface treated with tar and sand and 31 mi. of water-bound macadam streets were surface treated with asphaltic oil and sand. The Street Department spent over $20,000 for patching streets after opening by public utilities.

MEETINGS

Calendar of Coming Meetings

Jan. 15-16, 1920—Southern Appalachian Good Roads Association—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Jan. 29, 1920—National Highway Traffic Association—Annual convention, International Amphitheatre, Chicago, Ill. President, Arthur H. Blanchard, University of Michigan, Ann Arbor, Michigan.

Feb. 9-13, 1920—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Apr. 12-17, 1920—United States Good Roads Association.—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Apr. 16-17, 1920—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

American Association of State Highway Officials

Text of Important Resolutions Adopted at the Fifth Annual Meeting at Louisville

Resolution No. 1

WHEREAS; The Federal Aid Road Act provides for financial cooperation between the states and the Federal Government whereby the Government may contribute not more than 50% of the cost of any federal aid project; and

WHEREAS: This basis of cooperation is manifestly unfair to the so-called public land states, where vast areas exist in which the titles still rest in the Government, and such lands are not subject to taxation by said states; and

WHEREAS: On this account said states in many cases are unable to raise the funds necessary to meet the Government on a 50-50 basis, and thus complete their main trunk line roads which are an integral part of the interstate road system; therefore, be it

RESOLVED: By the American Association of State Highway Officials in convention assembled at Louisville, Ky., on Dec. 11, 1919, that the factors determining the total allotments of federal aid moneys to each state, as now fixed by law, be not disturbed; however in determining the percentage of cooperation required of each public land state, the following plan should be followed:

The percentage which the patented land area bears to the total area of such state, shall be determined by the Secretary of Agriculture; the 50% now required as such state's portion of cooperation shall be multiplied by the resultant percentage as above determined, and the figure obtained will be the minimum percentage which such state shall be required to furnish of the total of any federal aid project.

BE IT FURTHER RESOLVED: That nothing in the above resolution shall prevent any public land state from participating in a larger percentage than that above determined, on any federal aid project.

BE IT FURTHER RESOLVED: That this new basis of cooperation in public land states may apply to projects, now under project agreement, between such states and the Government, and on any project agreements that may hereafter be entered into between the same.

BE IT FURTHER RESOLVED: That a copy of these resolutions be addressed to the Senators and Representatives in Congress at the earliest possible moment, and that a copy be addressed to the Honorable Chief of Bureau, Bureau of Public Roads, and that legislation be urged at the present term of Congress to put the above provisions into effect.

Resolution No. 2

WHEREAS: The Federal and State Governments of our country have entered upon a program of improving the highways of the nation on a scale that makes this the greatest engineering project ever undertaken in the history of the world, at a cost to the taxpayers of many billions of dollars in the next decade; and

WHEREAS: To expend these vast sums efficiently and without waste—to get a dollar's worth of road for every dollar of tax—most urgently demands that the best engineering executive talent of the country be drawn into this work at once; and

WHEREAS: In order to draw the best talent into this work our state and national governments must offer conditions of employment much more favorable than generally prevail at present, both in the line of financial reward, in the permanency of the positions offered, and in freedom from political interference; and

WHEREAS: Wise provision for the future demands that the financial rewards offered should be such as to attract the best young men in the engineering colleges to prepare themselves for a life work in highway engineering; and

WHEREAS: A policy of niggardliness in this matter is one that can only bring disaster and waste in this great undertaking, and is, therefore, the most short-sighted economy.

BE IT RESOLVED: By the American Association of State Highway Officials, in convention assembled at Louisville, Ky., December 11, 1919, that our executive committee be instructed to present these facts with every proper urgency to the President and the Congress of the United States, and to the governors and legislative bodies of each state as soon as next they are in session; and that the executive committee be instructed to call to the attention of the various executives and legislative bodies, and impress upon them the necessity of revising the salaries of engineers upward in substantial accordance with the appended schedule and impress upon them that provision for its adoption is a measure of wisest public economy.

Resolution No. 4

BE IT RESOLVED: By the American Association of State Highway Officials, in convention assembled at Louisville, Kentucky, December 11, 1919, that its executive committee appoint a sub-committee to confer with a committee appointed by the Associated General Contractors to discuss matters of mutual interest and importance, and that the report of the conference be sent to the various state highway departments.

Resolution No. 5

RESOLVED: That The American Association of State Highway Officials, in convention assembled at Louisville, Kentucky, December 11, 1919, through its executive committee, urge on the Congress, the importance of taking the necessary steps for the United States to become a government member of the International Association of Road Congress, and that appropriation be made, therefor, RESOLVED FURTHER: That this action be taken at once in order that necessary arrangements may be made for holding the next meeting of the International Congress, (May, 1921) in this country.

Resolution No. 8

WHEREAS: The American Association of State Highway Officials was organized for the purpose of providing mutual cooperation and assistance to the state highway departments of the several states and the Federal Government, as well as for the discussion of legislative, economic and technical subjects pertaining to the administration of such departments; and,

WHEREAS: Many of the subjects to be discussed are of a more or less confidential or personal nature and relate only to the affairs of one or more of the departments forming the Associaiton;

THEREFORE, BE IT RESOLVED: By the American Association of State Highway Officials in convention assembled at Louisville, Kentucky, December 11, 1919, that the constitution and by-laws be so amended that honorary membership in the Association be abolished and the meetings of the the Association be open only to such persons as are eligible for full membership, provided, however, that the program committee appointed to prepare the program for any meeting may, with the approval of the president, extend to persons not eligible for membership special invitation to attend such meeting and address the Association on some specific subject or such persons as may be invited by the Executive Committee or Association in session.

Resolution No. 11

WHEREAS: The War Department has an abundance of surplus war materials, equipment and supplies, including motor vehicles, suitable for use in highway construction, and

WHEREAS, The Secretary of War has authority, under the provisions of Section 7 of the Post Office Appropriation Act, to transfer such surplus war material, equipment and supplies to the Department of Agriculture for distribution to the highway departments of the various states, and,

WHEREAS: The Secretary of War is disposing of and offering for disposition said war materials, equipment and supplies, instead of making the transfer to the Department of Agriculture as authorized and contemplated by law, and

WHEREAS: Economic returns to the people would be greater if the surplus material were used in highway construction than if sold at private sales,

BE IT RESOLVED: That it is the sense of the American Association of State Highway Officials, in convention assembled at Louisville, Kentcky, on December 11th, 1919, that H. B. 9412, generally referred to as the Kahn Bill, including the amendments recommended in a letter written by Mr. Thomas H. MacDonald, Chief of the Bureau of Public Roads, dated September 20th, 1919, and which appears as a part of the record of the hearing on the Kahn Bill before the House Military Affairs Committee, be immediately enacted into law and made effective, and,

BE IT FURTHER RESOLVED: That copies of this resolution be transmitted immediately to the House of Representatives of the United States.

Resolution No. 12

BE IT RESOLVED: That it is the sense of the American Association of State Highway Officials, in convention assembled at Louisville, Kentucky, December 11, 1919, that the state highway department of each state be requested to call upon influential citizens of their respective states to urge upon their Congressional delegation, the immediate passage of H. R. 9412 and the amendments recommended by Mr. Thos. H. MacDonald, Chief of Bureau, Bureau of Public Roads, in a letter dated September 20th, 1919, and addressed to the Sales Division of the War Department.

Resolution No. 14

WHEREAS: The vast program of highway construction now undertaken by the federal and state governments has great need of adequate topographic maps such as the Federal Government is now making; and

WHEREAS, These maps are now completed for only a small part of the area of the country; and

WHEREAS: The saving, in the expenditure of the highway funds entrusted to our supervision, if these maps are made available for our use, will be much greater than the cost of making these topographic maps; and

WHEREAS: At a conference recently held in Washington between the various federal and state agencies interested, a plan was developed whereby the whole country could be completely mapped by 1932 by proper cooperation between the state and the federal governments.

BE IT RESOLVED: By the American Association of State Highway Officials, in convention assembled at Louisville, Kentucky, December 11th, 1919, that our executive committee be instructed to bring this matter to the attention of the President and Congress of the United States, and the governors and legislative bodies of our respective states and urge upon them as a measure of economy that the Federal Government provide adequately for completing the topographic map of the United States by 1932, by appropriating the necessary sums to the Coast and Geodetic Survey and the Geological Survey; and that the state governments likewise be urged for the same reasons to provide for paying their share of the cost; and be it further

RESOLVED: That the executive committee be instructed to appoint a special committee whose duty it shall be to carry forward this work.

Resolution No. 16

WHEREAS: The Federal Congress and the legislative bodies of the several states have made available for highway construction during the years 1920 and 1921, funds generally exceding appropriations made for previous years; and,

WHEREAS: If these increased appropriations are to be efficiently and economically expended, adequate transportation facilities must be provided for the delivery of road building materials: and,

WHEREAS: During the past working season the supply of open-top cars available for the hauling of road aggregates was far short of the requirements for the carrying out of the road program of 1919, and if the number of open-top cars is not materially increased there will be a still greater shortage, which will prevent the carrying out of the proposed program for the coming year:

THEREFORE, BE IT RESOLVED: That the American Association of State Highway Officials, in convention assembled at Louisville, Kentucky, December 11, 1919, hereby directs its executive committee to use every means possible to impress upon Congress the necessity for making provision for an adequate number of open-top cars to be added to the equipment of the several railroad lines before the beginning of the next construction season.

Resolutions Nos. 17 and 18

WHEREAS: The states within whose boundaries are included national forest reserves have expended, during the last five years millions of dollars in the improvement of state and county highway systems, and,

WHEREAS: The majority of these states have issued bonds in large amounts in order to finance modern highway construction, and,

WHEREAS: There are within the boundaries of these states approximately 150,000,000 acres of national forest reserves, and,

WHEREAS: State and county highways of national importance traverse these reserves through areas involving the most difficult construction in the West, and, WHEREAS: The forests are a great national asset which should be preserved, and the construction of roads transversing them facilitates the control of forest fires which have in the past caused tremendous losses, and,

WHEREAS: The amount involved in road construction would represent but a small percentage of the value of the timber resources which could be preserved from destruction by fire, and the value of such national timber resources would be greatly increased by reason of the construction of an adequate highway system through and adjacent to the national forests, and,

WHEREAS: Appropriations heretofore made by Congress have been inadequate to permit of sufficient road construction within the national forests to keep pace with state and county highway systems, or to provide for a standard of construction equal to that of the several states and counties, and,

WHEREAS, The withdrawal of large areas has decreased the taxable resources of such states and counties, and has also operated to reduce their bonding capacity, and,

WHEREAS, It is the duty of the National Government to provide sufficient funds to develop its national resources, according to the same rate and standards as those of the states and counties concerned, now, therefore, be it

RESOLVED: That the American Association of Highway Officials, in conevntion assembled at Louisville, Kentucky on December 11th, 1919, urge upon Congress the necessity of appropriating at least $10,000,000 per year for the next ten years, at least 75% of which would be for expenditure in the construction of primary state and county highway systems within and adjacent to the national forests.

WHEREAS: Most of the conditions hereinbefore stated apply also to Indian and other federal reservations and to reserve and unappropriated lands of the United States, now, therefore, be it

RESOLVED: That the American Association of State Highway Officials, in convention assembled at Louisville, Kentucky, on December 11th, 1919, urge upon Congress the necessity of the appropriation of at least $2,500,000 for the fiscal year ending June 30th, 1921, and thereafter $5,000,000 per year for the next nine years, for the purpose of constructing highways in said areas.

FURTHER RESOLVED: That copies of this resolution be transmitted to the House of Representatives and U. S. Senate, and that the highway department of each state be requested to urge upon their Congressional delegations the passage of suitable bills making such appropriations available.

Resolution No. 19

WHEREAS: There have been introduced in Congress various bills contemplating or effecting federal participation in highway work, which bills represent a wide divergence of policies; and,

WHEREAS: We believe that it is necessary that Congress should take action on this matter during the present session in order to enable the states to more completely outline their program of highway building.

NOW, THEREFORE, BE IT RESOLVED: By the American Association of State Highway Officials, in convention assembled at Louisville, Kentucky, on December 11th, 1919:

1. That we urge the continuance of federal cooperation with the states in the building of roads under the terms of existing law and under the direction of present agencies. To this end we recommend and urge that Congress appropriate the following sums:

The sum of $100,000,000 for the fiscal year ending June 30, 1921.

The sum of $100,000,000 for the fiscal year ending June 30, 1922.

The sum of $100,000,000 for the fiscal year ending June 30, 1923.

The sum of $100,000,000 for the fiscal year ending June 30, 1924.

2. That all of said appropriation allotted to the several states shall be available for said states until one year after the expiration of the last appropriation.

3. That we favor an adequate national highway system upon which the federal aid funds will be concentrated. This system shall be selected by the various states in cooperation with the Bureau of Public Roads, and connected at the state lines by the federal department in cases where connections are not made by the adjoining states.

4. Realizing that the improvement of a system of national highways will be brought about in much shorter time through the cooperation of the Federal Government, and the states, under the plan proposed by this resolution, we favor the passage at this time of only such appropriations as will insure the continuation of the federal aid as provided for in this resolution.

5. That a copy of this statement be sent to each member of Congress.

PERSONAL MENTION

Max L. Cunningham has resigned as state highway engineer of Oklahoma.

J. N. Leech has resigned as city engineer of Steubenville, Ohio, to become county surveyor.

S. Herbert Griffith has resigned as roads engineer of Talbot County, Maryland.

H. P. Hayes, County Engineer of Tarrant County, Texas, has been put in charge of highway work in the county.

B. L. Taylor has been appointed county engineer of Woodbury County, Iowa, with headquarters at Sioux City.

Linn Brown has been appointed city engineer of Jefferson City, Mo.

F. E. Johnston, of Fort Smith, Ark., has been appointed city manager of Sallisaw, Okla.

W. E. Anderson has resigned as city manager of Brownsville, Texas, and has been appointed city engineer.

H. Frank Dorr has been elected county engineer of Cambria County, Pennsylvania.

J. W. McLaren has resigned as county engineer of Logan County, West Virginia, to enter the office of the division engineer of the State Highway Department at Huntington.

J. N. Smith has been appointed county engineer of Logan County, West Virginia, succeeding J. W. McLaren, resigned.

H. B. Bushnell has resigned as maintenance engineer of the Illinois State Highway Department to become connected with the staff of the Western Wheeled Scraper Co.

W. F. Cocke has resigned as state road commissioner of Florida to become deputy state highway commissioner of Virginia.

R. D. Coleman, County Engineer of Atchinson County, Kansas, has been appointed resident engineer in charge of hard-surfaced road construction in that county.

CONTRACT NEWS

ROADS AND STREETS

Bids Asked and Prospective Work

*TROY, ALA.—Bids will be received by City Council, until 7 p. m., Jan. 6, for grading, draining, curbing and brick, bitulithic, vibrolithic, asphalt or concrete paving on N. Three Notch St. Plans at office of Chas. F. White, City Clk.

*FLORENCE, ARIZ.—Bids will be received at office of Co. Highway Comn. of Pinal Co., until 2 p. m., Jan. 12 for 12 mi. of road between Oracle and Mammouth, involving about 80,000 yd. excavation, 600 yd. concrete etc.

Bids will be received at office of Co. Highway Comn. of Pinal Co., until 10 a. m., Jan. 13, for grading 30 mi. of road between Florence and Casa Grande, involving about 100,000 cu. yd. light earth, 900 cu. yd. concrete, etc. Plans at above office. E. G. Dentzer, Sec'y.

*PHOENIX, ARIZ.—Bids will be received by Co. Highway Comn. of Maricopa Co., until 2 p. m., Jan. 12, for 278 mi. of roads. Plans at above office. A. F. Jones, Sec'y.

VAN BUREN, ARK.—Road planned between this city and Washington; estimate, $10,494 per mi. Address H. E. Darton, State Highway Engr. Little Rock.

ELSINORE, CAL.—It is planned to expend about $50,000 for concrete paving here. Address City Clk.

*FRESNO, CAL.—Bids will be received by Bd. of Supvrs. of Fresno Co., until Jan. 9, for excavating, paving, concrete and corrugated iron culverts, etc., on 12 mi. of Elm Ave., and 5.35 mi. of Blackstone Ave.

LOS ANGELES, CAL.—Bids will be received by Bd. of Pub. Wks., in about 2 weeks for grading, curbing, guttering, paving, etc., on number of streets, A. C. Hansen, City Engr.

RIVERSIDE, CAL.—Concrete paving planned on 13 mi. of road between Therman and Mecca; estimate, $250,000. Adress Co. Engr. of Riverside Co.

VISALIA, CAL.—Plans being prepared for concrete paving on number of roads in Tulare Co. Address L. Moye, Co. Engr.

DENVER, COLO.—Concrete road planned between Brighton and Fort Lupton. Address T. J. Ehrhart, State Highway Comr.

*BUNNELL, FLA.—Bids will be received by Co. Comrs. of Flagler Co., until 2 p. m., Jan. 12, for grading, draining, hard surfacing and bridges on about 3.75 mi. of Deen Rd. Plans at office of Peter Kendrick, Civil Engr., Bunnell.

Bids will be received by Co. Comrs. of Flagler Co., until 2 p. m., Jan. 12, for hard surfacing about 26 mi. of roads in Shell Bluff Special Rd. and Bridge Dist., with ojus rock, coquina rock or periwinkle shell. Plans at office of S. C. Stallings, Co. Engr.

Bids will be received by Co. Comrs. of Flagler Co., until 2 p. m., Jan. 12, for clearing, grubbing, grading, draining, quarrying, crushing, loading, unloading and placing about 50,000 cu. yd. coquina rock on about 40 mi. of roads; also bridges and culverts in Haw Creek Special Rd. and Bridge Dist. Plans at office of S. C. Stallings, Co. Engr.

CLEARWATER, FLA.—New bids will be received for 22,000 yd. brick, asphalt block or sheet asphalt paving. Address W. H. Freeman, City Clk.

*ADEL, GA.—Bids will be received by Comrs. of Rds. and Revenues of Cook Co., at temporary courthouse, Adel, until noon, Jan. 7, for 14.79 mi. of road, involving about 86,787.78 sq. yd. vitrified brick, asphaltic concrete, Topeka mix, bituminous macadam, reinforced concrete or concrete paving, etc. Plans at above office, offices of State Highway Engr., Atlanta, and H. S. Jaudon Engineering Co., Project Engrs. Elberton.

BELLEVILLE, ILL.—It is planned to expend about $500,000 for road improvements in St. Clair Co. Address Co. Supt. of Highways.

CHICAGO, ILL.—It is planned to expend about $17,348,300 for extending and widening Robey St., Ashland and Western Aves. Address City Clk.

*PALESTINE, ILL.—Bids will be received by Village Clk., until Jan. 7, for concrete curbing, paving, etc., on Walnut and Main Sts. E. F. Mail, Engr., Robinson.

QUINCY, ILL.—It is planned to expend about $267,669 for paving 5 streets. Address City Clk.

ROCKFORD, ILL.—Bd. of Local Impts. plans to extend brick pavement on 7th St. to 23d Ave.; estimate, $66,200.

SPRINGFIELD, ILL.—Bids will be received by Bd. of Local Impts. early in spring for extensive paving improvements.

*BLOOMFIELD, IND.—Bids will be received by Co. Comrs. of Greene Co., until 2 p. m., Jan. 6, for 1 road in Highland Twp. and 1 in Wright and Smith Twps. Plans at office of Herschel Corbin, Co. Aud.

*COLUMBIA CITY, IND.—Bids will be received by Co. Comrs. of Whitley Co., until 10 a. m., Jan. 7, for grading, draining and graveling 23,456 ft. of road in Thorncreek Twp. Plans at office of Frank Burwell, Co. Aud.

*CORYDON, IND.—Bids will be received by Co. Comrs. of Harrison Co., until 2 p. m., Jan. 6, for grading, draining and stone paving on 3 mi. of road in Harrison Twp. Plans at office of Sam C. Mauck, Co. Aud.

Bids will be received by Co. Comrs. of Harrison Co., until 2 p. m., Jan. 6, for grading, draining and paving road about 3 mi. long in Jackson Twp.; also grading, draining and stone paving on road 14,520 ft. long, in Franklin Twp. Plans at office of Sam C. Mauck, Co. Aud.

*CRAWFORDSVILLE, IND.—Bids will be received by Co. Comrs. of Montgomery Co., until 10 a. m., Jan. 6, for grading, draining and graveling 10,560 ft. of road in Scott Twp. Plans at office of Dr. W. F. Batman, Co. Aud.

*FORT WAYNE, IND.—Bids will be received by Co. Comrs. of Allen Co., until 10 a. m., Jan. 12, for grading, draining and stone paving on 10,588 ft. of road in Monroe Twp.; also grading, draining and stone surfacing on slag base on 15,892 ft. of road in Lake and Washington Twps. Plans at office of Angus C. McCoy, Co. Aud.

*KENTLAND, IND.—Bids will be received by Co. Comrs. of Newton Co., until 2 p. m., aJn. 5, for road. Plans at office of S. R. Sizelove, Co. Aud.

*LAPORTE, IND.—Bids willbe received by Co. Comrs., of Laporte Co., until 10 a. m., Jan. 8, for grading, draining and paving road in Clinton and Cass Twps. Plans at office of Alfred H. Kimble, Co. Aud.

*LEBANON, IND.—Bids will be received by Co. Comrs. of Boone Co., until 10 a. m., Jan. 6, for grading, draining and concrete surfacing on 1 road in Sugar Creek Twp.; grading, draining and graveling 2 roads in Eagle Twp., 2 in Worth Twp.; 1 in Center Twp., 1 in Marion Twp., 1 in Sugar Creek Twp., 1 in Jefferson Twp., 1 in Clinton Twp., 1 in Center and Jackson Twps., and 1 in Center and Jefferson Twps. Plans at office of Cleve Goodwin, Co. Aud.

*MARTINSVILLE, IND.—Bids will be received by Co. Comrs. of Morgan Co., until 1 p. m., Jan. 6, for grading, draining and tarvia filled macadam paving on 2,780 ft. of road in Jackson Twp. Plans at office of H. H. Nutter, Co. Aud.

*PLYMOUTH, IND.—Bids will be received by Co. Comrs. of Marshall Co. until 1:30 p. m., Jan. 6, for grading, draining and graveling 3 roads in Bourbon Twp., 1 in Center Twp., 1 in Tippecanoe Twp., and 1 in Polk and West Twps. Plans at office of Otto H. Weber, Co. Aud.

*ROCKVILLE, IND.—Bids will be received by Co. Comrs. of Parke Co., until noon, Jan. 6, for grading, draining and graveling 6,290 ft. of road in Penn Twp. Plans at office of Ralph E. Porter, Co. Aud.

*WABASH, IND.—Bids will be received by Co. Comrs. of Wabash Co., until 10 a. m., Jan. 6, for grading, draining and concrete paving on 2 roads in Chester Twp.; also grading, draining and graveling 1 road in Noble Twp. Plans at office of Frank P. Kircher, Co. Aud.

*WILLIAMSPORT, IND.—Bids will be received by Co. Comrs. of Warren Co., until 1 p. m., Jan. 5, for 2 gravel roads in Liberty Twp., 10,739.5 and 11,930 ft. long; estimates, $14,659.26 and $12,997, respectively. Plans at office of Wm. H. Stephens, Co. Aud.

BELLE PLAINE, IA.—It is planned to expend about $30,000 for paving streets. Adress City Clk.

CLINTON CITY, IA.—Extensive street improvements, including curbing, guttering and paving, planned here. Address City Clk.

LAKE MILLS, IA.—Paving planned here. Address Town Clk.

LE MARS, IA.—Paving of 72 blocks planned during next year. Address City Clk.

*PELLA, IA.—Bids will be received until 4 p. m., Jan. 29, for about 5,500 lin. ft. concrete curb, 11,000 lin. ft. concrete curb and gutter and about 79,000 sq. yd. brick, concrete, bitulithic, asphaltic concrete or sheet asphalt paving. Address A. C. Kuyper, City Clk.

*REINBECK, IA.—Bids will be received until Jan. 6, for curbing, guttering and 35,000 sq. yd. reinforced concrete, bitulithic or sheet asphalt paving. Address R. B. Ferguson, Town Clk.

WILLIAMSBURG, IA.—Combined curbs and gutters and paving planned here; estimate, $100,000. Address E. Lewis, Town Clk.

WINFIELD, IA.—It is planned to expend about $30,000 for paving streets here. Address Town Clk.

GIRARD, KAN.—Grading, paving, bridges and culverts planned on road in Crawford Co.; estimate, $270,000. Address Co. Engr.

*LEAVENWORTH, KAN.—Bids will be received at office of J. E. Voorhees, Co. Clk. of Leavenworth Co., until 11 a. m., Jan. 5, for concrete road in Reno and Tonganoxie Twps. Plans at above office and office of Co. Engr.

GRAND RAPIDS, MICH.—Widening of Fulton St. contemplated. Address Gerald Wagner, City Engr.

*LANSING, MICH.—Bids will be received by Frank F. Rogers, State Highway Comr., Lansing, until 1:30 p. m., Jan. 5, for 5.984 mi. of Class B gravel road in Otisco and Keene Twps., Ionia Co. Plans at main office of State Highway Dept., Lansing, and Dist. Office, 601 Murray Bldg., Grand Rapids.

PORT HURON, MICH.—Concrete paving planned on Pine Grove Ave. Address Frank F. Rogers, State Highway Comr., Lansing.

*DULUTH, MINN.—Bids will be received by J. A. Farrell, City Comr., until Jan. 15, for grading, asphalt paving on concrete base, etc., on 6,990 ft. of Superior Ave.; estimate, $187,840.

FARIBAULT, MINN.—Grading and paving planned on road between here and Northfield; estimate, $420,000. Address Co. Aud. of Rice Co.

LUVERNE, MINN.—It is planned to expend about $300,000 fro paving 100 blocks. Address City Clk.

*MINNEAPOLIS, MINN.—Bids will be received by A. P. Erickson, Co. Aud. of Hennepin Co., until 11 a. m., Jan. 12, for 1 portable gravel screening and loading plant.

*JACKSON, MISS.—Bids will be received by Mayor and City Comrs., until 10 a. m., Jan. 6, for tandem roller; also asphalt plant and equipment. Specifications at office of F. M. Trussell, City Clk., and M. L. Culley, City Engr.

Bids will be received by Mayor and City Comrs., until 10 a. m., Jan. 6, for 300 tons asphalt for street paving. Specifications at office of F. M. Trussell, City Clk., and M. L. Culley, City Engr.

WINONA, MISS.—Bids will be received in about 1 mo., for paving streets. Address City Clk.

CLAYTON, MO.—Plans prepared by A. W Graham, State Highway Engr., Jefferson City, for brick or asphalt paving on 4 state highways in St. Louis Co.

*ST. LOUIS, MO.—Bids will be received by Bd. of Pub. Serv. until Jan. 5, for brick paving on Ellenwood and Russell Aves.; estimates, $23,950 and $74,100, respectively; wood block paving on Douglas St., $15,200; asphalt paving on Northeast King's Highway, $125,750.

Bids will be received by Bd. of Pub. Serv., until Jan. 15, for vitrified brick paving on 1 block of Whittier St. and 5 blocks of Morganford Rd.; estimates, $14,550 and $75,050, respectively.

Bids will be received by Bd. of Pub. Serv., until Jan. 17, for brick paving on Page Blvd. and asphalt paving on Compton Ave.

LIVINGSTON, MONT.—Bids will be received in about 1 month, for paving 140 blocks. Address C. T. Sakett, City Engr.

CENTRAL CITY, NEB.—Bids will be received shortly for 0.5 mi. of asphalt paving. Address City Clk.

COZAD, NEB.—Bids will be received shortly for about 30,000 yd. vitrified brick paving on concrete foundation; estimate, $140,000. Address City Clk.

*TRENTON, N. J.—Bids will be received by State Highway Comn., until Jan. 7, for road in South Amboy, involving 9,702 sq. yd. concrete surfacing. Plans at above office. A. Lee Grover, Chief Clk.

*SANTA FE, N. M.—Bids will be received at office of State Highway Comn., until 2 p. m., Jan. 14, for State Rd. No. 1, Sec 2, between Raton and a point 14.37 mi. south. Work involves 46,270 cu. yd. excavation, 37,862 cu. yd. borrow, 23,914 sta. yd. overhaul, 22,386.24 cu. yd. one course gravel surfacing, 15 cu. yd. rip rap, 64.51 cu. yd. Class A concrete, 133.26 cu. yd. Class B concrete, 686 lin. ft. 18 to 36-in. diameter, 14 and 16 gauge, corrugated iron culverts, 24.21 lb. expanded metal reinforcement, 267.5 lb. ½-in. sq. reinforcing bars, 105 lin. ft. 2-in. pipe railing, 2,672 lin. ft. wooden piling, 18,010 B. M. ft. substructure lumber and 39,717 B. M. ft. superstructure lumber. Plans at offices of State Highway Engr., Santa Fe and Dists Engr., Raton.

*GREENSBORO, N. C.—Bids will be received at Div. Office of State Highway Comn., Greensboro, until Jan. 3, for 8 mi. of hard surfaced road in Alamance Co. and 2.3 mi. of top soil road in Stanly Co. Address W. S. Fallis, State Highway Engr., Raleigh.

SALISBURY, N. C.—Plans prepared for bitulithic paving on S. Fulton St. Address City Clk.

It is planned to hard surface 3 mi. and sand-clay surface 7.5 mi. of roads in Rowan Co. Address Co. Clk.

CINCINNATI, O.—Paving number of streets planned. Address F. Krug, City Engr.

CLEVELAND, O.—It is planned to expend about $3,000,000 for Cuyahoga Co. roads next year. Address Co. Surv.

COLUMBUS, O.—Resolutions passed for paving number of streets. Address City Engr.

Bids will be received by Co. Comrs. of Franklin Co., in about 2 months, for road improvements; estimate, $750,000. Address Co. Surv.

Franklin Co. plans to improve number of roads. Address Co. Surv.

JEFFERSON, O.—Plans being prepared for monolithic brick paving on 6.5 mi. of Ashtabula-Austinburg Rd.; estimate, $150,000; also for monolithic brick or concrete on several sections of Conneaut-Youngstown Rd. Address Co. Surv. of Ashtabula Co.

Concrete or monolithic brick paving planned on 6.5 mi. of Rock Creek-Orwell Rd. and 6.75 mi. of Trumbull-Windsor Rd. Address Co. Surv. of Ashtabula Co.

LAKEWOOD, O.—It is planned to expend about $50,000 for grading, draining, curbing and paving 11,250 ft. of streets. Address E. A. Fischer, Engr., Lakewood.

SANDUSKY, O.—Plans formulated for $1,000,000 road improvement program in Erie Co. Address Co. Clk.

BETHLEHEM, PA.—Paving of several streets contemplated. Address R. E. Fox, City Engr.

*HARRISBURG, PA.—Bids will be received by State Highway Dept., until Jan. 19, for furnishing, delivering and installing dumping equipment with hydraulic and hand hoist, on Peerless, Heavy Aviation, Nash, Pierce and Packard chassis. (See advertisement in this issue of GOOD ROADS.)

CHARLESTON, S. C.—Bids will be received shortly for improving 7 mi. of Charleston-Savannah Highway. Address Co. Clk. of Charleston Co.

*LA GRANGE, TEX.—Bids will be received by Comrs. Court of Fayette Co., until Jan. 16, for grading, draining and graveling 11.27 mi. of road; estimate, $144,827. J. P. Ehlinger, Co. Judge.

*LIBERTY, TEX.—Bids will be received by Comrs. Court of Liberty Co., until Jan. 16, for grading, graveling, trestle, etc., on 8.518 mi. of road between Cleveland and Montgomery Co. line. C. N. Smith, Co. Judge.

*SNYDER, TEX.—Bids will be received until Jan. 12, for 10 mi. of gravel road in Scurry Co. Address W. S. Adamson, Co. Judge.

*WACO, TEX.—Bids will be received by Comrs. Court of McLennan Co., until Jan. 2, for concrete paving, etc., on 0.63 mi. of Waco-Axtell Rd., also reinforced concrete paving on 0.38 mi. of Waco-Springfield Rd.

WOODVILLE, TEX.—Bids will be received in about 1 mo., for number of roads and bridges in Tyler Co. Address W. A. Johnson, Co. Judge.

*CHARLESTON, W. VA.—Bids will be received by L. C. Massey, Co. Clk. of Kanawha Co., until 11 a. m., Jan. 14, for grading, draining, concrete paving, etc., on Elk River Rd. Plans at ofices of Co. Engr., and State Rd. Comn., Charleston.

*FAYETTEVILLE, W. VA.—Bids will be received at office of C. E. Mahan, Clk. of Co. Court of Fayette Co., until Jan. 5, for grading, draining and concrete, bituminous macadam, or other improved types of paving on about 8 mi. of road in Nuttall Dist. Plans at office of J. K. McGrath, Co. Rd. Engr.

*HAMLIN, W. VA.—Bids will be received by Co. Court of Lincoln Co., until Jan. 6, for improving 6,000 ft. of road betwen this city and West Hamlin; estimate, $65,000.

LOGAN, W. VA.—Bids will be received in about 2 months, for grading and hard surfacing 50 mi. of roads and constructing 4 bridges in Logan Co. Address Co. Rd. Engr.

*WILLIAMSON, W. VA.—Bids will be received by Co. Court of Mingo Co., until 2 p. m., Jan. 6, for about 8 mi. of road on Pigeon Creek. Plans at offices of L. C. Linkous, Co. Rd. Engr., Williamson, State Rd. Comn., Charleston, and Div. Rd. Engr., Huntington.

MADISON, WIS.—Following are Federal and State Rd. Projects planned for 1920: Adams Co., Adams-Kilbourn Rd., about 6 mi. grading, draining, clay surfacing and culverts; estimate, $42,000; Kilbourn-Friendship Rd., grading, draining, clay surfacing and culverts, $45,000; Ashland Co., Sanborn and Ashland Junction Rds., grading, draining, concrete and sand-clay surfacing and culverts, $60,000; Barron Co., Barron-Poskin Rd., grading, draining and culverts, $45,000; Canton-Chetek Rd., grading, draining and culverts, $30,000; Bayfield Co., Ashland-Iron River Rd, grading, draining, partly surfacing and culverts, 171,000; Brown Co., Green Bay-Oconto Rd., grading, draining, concrete surfacing and culverts, $90,000; Buffalo Co., Alma-Mondovi Rd., grading, draining, concrete surfacing and culverts, $66,000; Burnett Co., Siren-Webster Rd., grading, draining, graveling and culverts, $60,000; Calumet Co., Chilton-Hilbert Junction Rd., grading, draining, concrete surfacing and culverts, $162,000; Chippewa Co., Cornell-Bloomer Rd., grading, draining, graveling and culverts, $30,000; Clark Co., Neillsville-Hambird Rd., grading, draining, disintegrated granite surfacing and culverts, $24,000; Owen-Abbotsford Rd., graveling, $21,000; Abbotsford-Medford Rd., grading, draining, gravel or granite surfacing, $36,000; Columbia Co., Portage-Columbus Rd., grading, draining, gravel or top soil surfacing and culverts, $81,000; Madison-Portage Rd., grading, draining, bridges and culverts, $42,000; Crawford Co., Mauzeka-Praire du Chien Rd., grading, draining and culverts, $90,000; Dodge Co., Watertown Plank Rd., grading, draining, concrete surfacing and culverts, $54,000; Door Co., Green Bay-Sturgeon Bay Rd., grading, draining, stone and gravel surfacing and culverts, $75,000; Douglas Co., Superior-Solon Springs Rd., grading, draining, concrete surfacing and culverts, $150,000; Dunn Co., Menomonie-Hudson Rd., grading, draining and culverts, $48,000; Menomonie-Eau Claire Rd., grading, draining, concrete surfacing and culverts, $90,000; Eau Claire Co., Birch St., grading, draining, concrete surfacing and culverts, $18,000; Eau Claire-Osseo Rd., grading, draining, concrete surfacing and culverts, $30,000; Grant Co., Platteville-Dubuque Rd., grading, draining, partly surfacing and culverts, $72,000; Fond du Lac Co., Fond du Lac-Milwaukee Rd., grading, draining, concrete surfacing and culverts, $114,000; Forest Co., Crandon-Laona Rd., grading, draining, graveling and culverts, $36,000; Boscobel-Fennimore Rd., grading, draining, partly surfacing with concrete, and culverts, $60,000; Greene Co. Monroe-Monticello Rd. concrete surfacing, $180,000; Monroe-Monticello Rd., grading, draining and culverts, $57,000; Green Lake Co., Berlin-Auroraville Rd., grading, draining, graveling and culverts, $9,000; Iowa Co., Madison-Dodgeville Rd., grading, draining and culverts, $75,000; Iron Co., Hurley-Mercer Rd., grading, draining and culverts, $30,000; Jefferson Co., Watertown Plank Rd., grading, draining, concrete surfacing and culverts, $57,000; Watertown Plank Rd., grading, draining, concrete surfacing and culverts, $42,000; Juneau Co., Adams and Bridge Sts., grading, draining, concrete surfacing and culverts, $30,000; New Lisbon-Necedah Rd., grading, draining, top soil or clay surfacing and culverts, $30,000; Mauston-Elroy Rd., grading, draining and culverts, $30,000; Kenosha Co., Geneva Rd., grading, draining, concrete surfacing and culverts, $120,000; Kewaunee Co., Green Bay-Sturgeon Bay Rd., grading, draining, graveling and culverts, $33,000; La Crosse Co., La Crosse-Sparta Rd., grading, draining, concrete surfacing and culverts, $99,000; La Crosse-Sparta Rd., grading, draining, tar bound macadam surfacing and culverts, $57,000; Lafayette Co., Darlington-Hicks Corner Rd., grading, draining, partly surfacing and culverts, $78,000; Schullsburg-Benton Rd., grading, draining and culverts, $30,000; Langlade Co., Antigo-Merrill Rd., grading, draining and culverts, $45,000; Lincoln Co., Merrill-Tomahawk Rd., grading, draining, graveling and culverts, $48,000; Merrill-Medford Rd., grading draining and culverts, $42,000; Manitowoc Co., Manitowoc-Two Rivers Rd., grading, draining, concrete surfacing and culverts, $54,000; Manitowoc-Sheboygan Rd., grading, draining, concrete surfacing and culverts, $132,000; Marinette Co., Pembina-Iron Mountain Rd., grading, draining and culverts, $48,000; Marquette Co., Montello-Oxford Rd., grading, draining, graveling and culverts, $42,000; Milwaukee Co., Fox Point-Brown Deer Rd., grading, draining, concrete surfacing and culverts, $150,000; Monroe Co., La Crosse-Sparta Rd., grading, draining, concrete surfacing and culverts, $24,000; Sparta-Black River Falls Rd., $78,000; Oconto Co., Green Bay-Stiles Junction Rd., grading, draining, graveling and culverts, $51,000; Oneida Co., Rhinelander-Eagle River Rd., grading, draining, graveling and culverts, $39,000; Ozauke Co., Lake Shore Rd., grading, draining and culverts, $90,000; Pepin Co., Durand-Alma Rd., grading, draining, shale or gravel surfacing and culverts, $19,200; Mondovi-Durand Rd., grading, draining, shale or gravel surfacing and culverts, $13,500; Pierce Co., Ellsworth-River Falls Rd., grading, draining, graveling and culverts, $105,000; Polk Co., St. Croix Falls-Barron Rd., grading, draining, partly surfacing and culverts, $63,000; Amery-Balsam Lake Rd., grading, draining and culverts, $36,000; Portage Co., Stevens Point-Marshfield Rd., grading, draining, concrete surfacing and culverts, $60,000; Price Co., Fifield-Radisson Rd., grading, draining and culverts, $48,000; Richland Co., relocating and constructing Cazenovia Bridge and its approaches, concrete, $24,000; Richland Center-Boaz Rd., grading, draining and culverts, $54,000; Rusk Co., Glen Flora-Tony Rd., grading, draining and culverts, $9,000; Ladysmith-Bruce Rd., grading, draining, relocating and culverts, $42,000; St. Croix Co., Hudson-Eau Claire Rd., grading, draining and culverts, $45,000; Hudson-Menomonie Rd., grading, draining, concrete surfacing and culverts, $90,000; Sauk Co., Reedsburg-La Valle Rd., grading, draining, graveling and culverts, $33,000; Kilbourn-Mauston Rd., grading, draining, gravel on top soil surfacing and culverts, $12,000; Baraboo-Portage Rd., grading, draining, bituminous macadam surfacing and culverts, $45,000; Shawano Co., Shawano-Appleton Rd., grading, draining, graveling and culverts, $63,000; Shebokgan Co., Lake Shore, Rd., grading, draining, concrete surfacing and culverts, $120,000; Taylor Co., Medford-Cornell Rd., grading, draining and culverts, $36,000; Phillips-Medford Rd., graveling, $24,000; Trempealeau Co., Whitehall-Ettrick Rd., grading, draining, graveling and culverts, $120,000; Vernon Co., Viroqua-Prairie du Chien Rd., grading, draining, concrete surfacing and culverts, $90,000; Vilas Co., Woodruff-Fifield Rd., grading, draining and culverts, $60,000; Eagle River Rd., grading, draining, graveling and culverts, $60,000; Washburn Co. Minong-Hayward Rd., grading, draining and culverts, $78,000; Spooner-Hayward Rd., grading, draining, partly top soil surfacing and culverts, $37,500; Washington Co., West Bend-Wilwaukee Rd., grading, draining, concrete surfacing and culverts, $57,000; Waukesha Co., Milwaukee-Madison Rd., grading, draining, concrete surfacing and culverts, $93,000; Milwaukee-Fond du Lac Rd., grading, draining, concrete surfacing and culverts, $66,000; Waupaca Co., Waupaca-Weyauwega Rd., grading, draining, concrete surfacing and culverts, $151,500; Trunk Highway No. 18, grading and bridges, $75,000; Waushara Co., Berlin-Auroraville Rd., grading, draining, graveling and culverts, $45,000; Portage-Stevens Point Rd., grading, draining, graveling and culverts, $18,000; Winnebago Co., Oshkosh-Appleton Rd., grading, draining, concrete surfacing and culverts, $207,000. Address A. R. Hirst, State Highway Engr.

ASHLAND, ORE.—Contract for grading and paving 1.5 mi. of street awarded to Oscar Huber, Portland, at $13,555.

BAKER, ORE.—Contract for graveling 7.8 mi. of road awarded to F. C. Oxman, Baker, at $38,000.

ERIE, PA.—Contract for paving 18th St. awarded to J. & M. Doyle, at $17,687.

McKINNEY, TEX.—Contract for 25 mi. of road in Collin Co. awarded to F. D. Perkins, McKinney.

MOUNT VERNON, TEX.—Contract for constructing part of Jefferson Highway in Franklin Co., awarded to Smith Bros., Crockett.

ODESSA, TEX.—Contract for 9.75 mi. of road in Ector and Crane Counties awarded to Lee-Moore Contracting Co., El Paso.

SAN ANTONIO, TEX.—Bids received Oct. 23, for graveling roads in Bexar Co., rejected. C. E. Hoff, Co. Engr.

DANVILLE, VA.—Contracts for improving W. Main and S. Main Sts, awarded to J. Thomas and C. L. Bennett.

EDMOND, OKLA.—Contract for paving 42 blocks awarded to H. F. Struble, Norman.

TULSA, OKLA.—Contracts for 120,000 sq. yd. asphaltic concrete paving awarded to F. P. McCormick and Standard Paving Co.

PORTLAND, ORE.—Contracts for grading, macadamizing, etc., on number of roads awarded to Oscar Huber, at about $686,422.

Contract for 15.2 mi. of Mackenzie Highway awarded to A. Guthrie & Co., at $199,588; grading 9.23 mi. of John Day Highway to Morrison & Knudson, at $81,155; grading and graveling 7.5 mi. of Old Oregon Trail, to Clifton, Applegate & Toole, at $100,701.

BEAVER FALLS, PA.—Contract for paving 6th Ave. awarded by Town Council to S. Gamble Co., Carnegie, at about $70,000.

HARRISBURG, PA.—Contracts for roads awarded by State Highway Dept., as follows: Berks Co., 27,633 ft. bituminous mixture on prepared broken stone base, Philadelphia Paving Co., Philadelphia, $60,423.75; Bucks Co., 20,902 ft. reinforced concrete, Benjamin Foster Co., Philadelphia, $144,085.50; Bradford Co., 19,215 ft. reinforced concrete, T. H. Gill Co., Binghamton, N. Y., $150,568.09; Erie Co., 7,900 ft., E. M. Love & Son, Corry, $72,523.80.

MEYERSDALE, PA.—Contract for grading Grant St., awarded to B. J. Lumber & Co., Meyersdale, at $4,064.

PITTSTON, PA.—Contract for street paving awarded by City Council to Jos. Newcomb, Pittston, at $11,500.

BRIDGES

Bids Asked and Prospective Work

*FLORENCE, ARIZ.—Bids will be received at office of Co. Highway Comn. of Pinal Co., until 2 p. m., Jan. 19, for reinforced concrete arch bridge at Ray, 2 100-ft. clear arches, and about 130 ft. concrete retaining wall; also taking down, loading, shipping and re-erecting 1 200-ft. steel span near Winkelman and furnishing and erecting 200 ft. additional to the steel structure together with piers, abutments, wings, etc. Plans at above office. E. G. Dentzer, Sec'y.

BRIDGEPORT, CONN.—It is planned to expend about $100,000 for repairing bridge over Johnson Creek. Address City Clk.

AMERICUS, GA.—Bridge planned over Flint River on road between here and Cordele. Address Co. Clk. of Sumter Co.

ATLANTA, GA.—Twenty-two bridges in Fulton Co. washed away. Address Oscar Mills, Chmn. of Co. Pub. Wks. Com.

*GREENSBORO, GA.—Bids will be received by Co. Comrs. of Greene Co., until Jan. 15, for bridge over Richland Creek on Eatonton-Greensboro Rd. Plans at offices of Co. Clk. Greensboro, State Highway Engr., Walton Bldg., Atlanta, and Mitcham & Wright, Project Engrs., 712 Flatiron Bldg., Atlanta.

GRIFFIN, GA.—Spalding Co. plans to expend about $40,000 for replacing bridges recently destroyed by heavy rain. Address Co. Clk.

LAGRANGE, GA.—Steel bridge at West Point and Sterling Bridge washed away by flood. Address Co. Clk. of Troup Co.

*REID'S FERRY, GA.—Bids will be received by Co. Comrs. of Greene and Putnam Counties, at site of proposed bridge, Reid's Ferry, until 11 a. m., Jan. 15, for steel and concrete bridge over Oconee River on Greensboro and Eatonton Rd., 3 100-ft. spans. Plans at offices of Co. Clk. of Greene Co., Greensboro, State Highway Engr., Walton Bldg., Atlanta, and Mitcham & Wright, Project Engrs., 712 Flatiron Bldg., Atlanta.

*BLACKFOOT, IDAHO—Bids will be received by Co. Comrs. of Bingham Co., until Jan. 26, for 316.575 lb. I-beams, etc. F. M. Fisher, Co. Clk.

CHARLESTON, ILL.—Plans completed for 4 bridges in Coles Co. Address Co. Supt. of Highways.

*LEAVENWORTH, KAN.—Bids will be received at office of J. E. Voornees, Co. Clk. of Leavenworth Co., until 11 a. m., Jan. 5, for bridge in Reno Twp., 3 40-ft. spans, 18-ft. roadway. Plans at above office and office of State Highway Comn., Topeka

BOGALUSA, LA.—Bridge over Pearl River in this city, contemplated. Address Duncan Buie, State Highway Engr., New Orleans.

BOSTON, MASS.—City plans new structure to replace Chelsea South Bridge; estimate, $500,000. Address City Engr.

CHELSEA, MASS.—It is planned to expend about $500,000 for steel and concrete bridge. Address Dept. of Pub. Wks.

*DETROIT, MICH.—Bids will be received at office of Dept. of Pub. Wks., until 10 a. m., Jan. 17, for subway section of Detroit Approach to Belle Isle Bridge. Plans at office of Esselstyn, Murphy & Hanford, Engrs., 810 Marquette Bldg., Detroit.

Suspension bridge with clearance of 110 ft. planned over river between this city and Canada. Gustav Lindenthal, 25 Church St., New York, N. Y., interested.

IRONWOOD, MICH.—Viaduct planned over R. R. Tracks at Marquette or Curry Sts. Address City Clk.

LANSING, MICH.—Concrete bridge planned over Grand River at St. Joseph St. Address J. A. Parsons, City Clk.

*DULUTH, MINN.—Bids will be received by Co. Aud. of St. Louis Co., until Jan. 6, for several steel bridges.

*MOORHEAD, MINN.—Bids will be received by Co. Comrs. of Clay Co., until Jan. 6, for bridge over south branch of Wild River near Ulen, A. C. Hougland, Co. Aud.

*BELTON, MONT.—Bids will be received by Dept. of Interior, Washington, D. C., until 2 p. m., Jan. 20, for reinforced concrete or steel bridge over middle fork of Flathead River near here.

NEWARK, N. J.—Bridge planned over Morris Canal near Heller Parkway; estimate, $50,000. Address M. R. Sherrerd, City Engr.

PATERSON, N. J.—New bridge over Erie R. R. at Hawthorne, Passaic Co., contemplated. Address Jos. MacDonald, Dir. of Bd. of Freeholders. z

TRENTON, N. J.—Steel and concrete bridge, 369 ft. long, 32 ft. wide, planned over Canal and Pennsylvania R. R. Tracks at Southard St.; estimate $155,000. Address Co. Clk. of Mercer Co.

BALLSTON SPA, N. Y.—Resolution adopted for bridge over Mohawk River at Vischers Ferry, Saratoga Co. Address Co. Supt. of Highways.

FAYETTEVILLE, N. Y.—Plans completed for bridge over Limestone Creek. Address City Clk.

CLEVELAND, O.—It is planned to expend about $7,000,000 for Huron-Lorain bridge, 3,750 ft. long, 80 ft. wide. Address W. A. Stinchcomb, Co. Engr. of Cuyahoga Co.

COLUMBUS, O.—Bridge planned over Scioto River at Greenlawn Ave.; estimate, $300,000. Address Co. Surv. of Franklin Co.

JEFFERSON, O.—Two steel bridges planned at Ashtabula and Conneaut, Ashtabula Co.; estimates, $250,000 and $300,00, respectively. Address Co. Clk.

*BETHLEHEM, PA.—Bids will be received until Feb. 7, for reinforced concrete and steel bridge between this city and South Bethlehem; estimate, $2,315,000. Address City Clk.

CHARLESTON, S. C.—Steel bridge planned over Coast Line R. R. Tracks at Ashley Junction near here. Address Charleston County Sanitary and Drainage Comn.

*PLANKINTON, S. D.—Bids will be received by Co. Comrs. of Aurora Co., until Jan. 6, for 3 reinforced concrete bridges, 2 8 ft. and 1 24 ft. long. A. V. DePue, Aud.

REDFIELD, S. D.—Spink Co. plans new concrete rainbow arch bridge over St. James River. Address Co. Clk.

*WESSINGTON SPRINGS, S. D.—Bids will be received by Co. Comrs. of Jerauld Co., until Jan. 6, for several steel and concrete bridges. L. E. Johnson, Co. Aud.

BALLINGER, TEX.—Plans being prepared for reinforced concrete and steel bridge over Colorado River, 518 ft. long; estimate, $61,432. Address Hess & Skinner, Engrs., Southwestern Life Bldg., Dallas.

PORTSMOUTH, VA.—Extensive improvements planned on 2 important bridges in Norfolk Co., Address Co. Clk.

*SEATTLE, WASH.—Bids will be received by Co. Comrs. of King Co., until 10 a. m., Jan. 6 for bridges. Norman M. Wardall, Co. Clk

Bids will be received by C. E. Doyle, General Purchasing Agent of Alaskan Engineering Comn., Seattle, until Jan. 26, for furnishing and erecting 1 steel bridge in Alaska. Plans at above office and offices of Comn., 102 Custom House, Portland, Ore., 307 Custom House, San Francisco, Cal., U. S. Reclamation Service, 505 Tramway Bldg., Denver, Colo., and Supt. of Warehouse, Indian Service, 308 S. Green St., Chicago, Ill.

ALMA, WIS.—Plans being prepared for bridge in Town of Belvidere, Buffalo Co., 12x24-ft. reinforced concrete span, concrete abutments. Address J. Reinhart, Co. Highway Comr., Nelson.

BLACK RIVER FALLS, WIS.—Bridge planned in Town of Albion, Jackson Co., 16x20-ft. concrete structure, concrete abutments. Address Wm. Tibbitts, Co. Highway Comr., Black River Falls.

DARLINGTON, WIS.—Concrete bridge will be constructed over Pecatonica River in this city, next spring; estimate, $30,000. Adress City Engr.

FRIENDSHIP, WIS.—Plans being prepared for Witches Gulch Bridge in Town of Dell Prairie, Adams Co., 10x24-ft. reinforced concrete span, concrete abutments. Address J. A. McGregor, Co. Highway Comr., Friendship.

OCONTO, WIS.—Bridges planned in Oconto Co., as follows: Town of Armstrong, Second South Branch Bridge, 40x20-ft. reinforced concrete deck girder span; First South Branch Bridge, 30x20-ft. reinforced concrete girder, Waupee Bridge, 30x24-ft. deck girder; Town of Gillett, Bowen Bridge, 12x24-ft. concrete slab; Town of Morgan, Demeny Bridge No. 2, 8x22-ft. concrete slab; Johnson Bridge, 6x24-ft. concrete slab; Havelik Bridge, 6x20-ft. concrete slag bridge; Town of Sprice, Blazek Bridge, 8x12-ft. concrete slab bridge; Village of Suring, Middle Bridge, 18x24-ft. concrete slab bridge; all concrete abutments. Adress Peter Peetz, Co. Highway Comr., Oconto.

PRAIRIE DU CHIEN, WIS.—Plans being prepared for 2 bridges in Town of Clayton, Crawford Co., 6x24-ft. reinforced concrete slab bridge and 12x24-ft. reinforced concrete structure; also for 1 bridge in Town of Marietta, 20x24-ft. reinforced concrete, all concrete abutments. Address J. N. Campbell, Co. Highway Comr., Bell Center.

SHAWANO, WIS.—Plans being prepared by State Highway Comn., for following bridges in Shawano Co.; Town of Angelica, 3 bridges, 18x20-ft. reinforced concrete span; Towns of Bartelme and Seneca, 45x20-ft, reinforced concrete span; Town of Green Valley, 2 bridges, 30x20-ft. concrete span and 8x24-ft. reinforced concrete span; Town of Hartland, 4 bridges, 14x20-ft., 12x20-ft., 20x20-ft. and 20x24-ft. concrete spans; Town of Pella, 30x24-ft. reinforced concrete span; Town of Seneca, 18x20-ft. reinforced concrete span. Address M. W. Torkelson, State Bridge Engr., Madison.

SPARTA, WIS.—Plans being prepared for 30x24-ft. reinforced concrete deck girder bridge in Town of La Grange, Monroe Co. Address C. H. Millard, Co. Highway Comr., Sparta.

SUPERIOR, WIS.—Plans being prepared for bridge in Town of Superior, Douglas Co., 16x20-ft reinforced concrete span, concrete abutments. Address C. J. Morisset, Co. Highway Comr., Superior.

WAUTOMA, WIS.—Plans being prepared for Birch Creek Bridge in Town of Wautoma, Waushara Co., 12x24-ft. reinforced concrete span. Address Fred Grimm, Co. Highway Comr., Wautoma.

ERICKSON, B. C.—It is planned to construct bridge over Goat River near here, by day labor. Address Provincial Dept. of Pub. Wks.

Bids Received and Contracts Awarded

FRESNO, CAL.—Contract for reinforced bridge over Fowler Switch Canal on Sanger-Academy Ave. awarded to J. E. Mitchell at $6,036.87.

MODESTO, CAL.—Contract for reinforced concrete bridge over Turlock Irrigation District Canal east of Denair, Stanislaus Co. awarded to Cotton & McCauley, San Francisc,o at $4,532.

MIDLETOWN, CONN.—Contract for bridge awarded to A. Brazos & Son, Inc., 88 Oak St., Middletown, at $15,000.

BRADENTOWN, FLA.—Contract for bridge over Sarasota Bay awarded to J. R. Chambles, 213 E. Oak Ave., Tampa, at $23,379.

DIXON, ILL.—Contract for repairing Galena Ave. Bridge awarded to Freeport Bridge Co., Freeport, at $34,869.

OREGON, ILL.—Contract for reinforced concrete bridge in Flagg Twp., Ogle Co., awarded to Fred Kaney, Forreston, at $4,859.

SPRINGFIELD, ILL.—Contract for bridge between Sullivan Twp., Morgan Co., and Okaw and Windsor Twps., Shelby Co. awarded to Rochester Bridge Co., Rochester, at $41,000.

TRENTON, IA.—Lowest bid received for abutments and wing walls for bridge at Mill Creek submitted by Fred Bodenhofer, at $4,189.

GRAND RAPIDS, MINN.—Contract for bridge over Bigfork River awarded to Andrew Anderson, at $5,178.

CANTON, MISS.—Contract for steel and concrete bridge over Pearl River at Meeks Ferry awarded to Vincennes Bridge Co., Vincennes, Ind., at $294,000.

GREENWOOD, MISS.—Contract for bridge over Moore's Lake on Shellmound-Sunny Side Rd. awarded to W. T. Young Construction Co., Nashville, Tenn., at about $22,700.

TRENTON, N. J.—Contract for bridge awarded by Bd. of Freeholders of Mercer Co., to H. Morgan, 12 N. Willow St., at $9,346; other bridge to L. J. Seiling, 211 Broad St., Red Bank, at $3,572.

GREENVILLE, N. C.—Contract for concrete bridge over Tar River awarded by Co. Comrs. of Pitt Co., to A. P. Gilbert, Durham, at $15,074.

CLEVELAND, O.—Contract for bridge work in this city awarded to C. R. White, Lakewood, at about $25,000.

TULSA, OKLA.—Contract for reconstructing Bird Creek Bridge awarded to Jos. T. Lantry, Tulsa, at $15,395.

SAN ANGELO, TEX.—Contract for concrete bridge in Tom Greene Co. awarded to McCall-Moore Engineering Co., Waco.

NORTH YAKIMA, WASH.—Contract for Piland Bridge awarded by Co. Comrs. of Yakima Co., to Union Bridge Co., Portland, at $17,890.

ENDERBY, B. C.—Contract for bridge awarded by Provincial Dept. of Pub. Wks. to Robt. Moncrieff, Kent Hotel, Victoria, at $16,400.

BONDS

LOMPOC, CAL.—Election Feb. 3, on $400,000 bonds for road between here and coast. Address Co. Clk. of Santa Barbara Co., Santa Barbara.

MODESTO, CAL.—Issue of $100,000 paving bonds voted. Address City Clk.

SAN BERNADINO, CAL.—Proposed $60,000 bonds for 2 bridges, defeated.

SAN LUIS OBISPO, CAL.—Issue of $1,500,000 road bonds voted in San Luis Obispo Co. Address Co. Clk.

YREKA, CAL.—Issuance of $100,000 bonds for road improvements in Siskiyou Co. contemplated. Address Co. Clk.

BROOKSVILLE, FLA.—Election planned in Hernando Co. on road bonds. Address Co. Clk.

MAYO, FLA.—Issue of $400,000 bonds voted for road improvements in 1st, 2d, 3d and 8th Dists. of Lafayette Co. Address Co. Clk.

MILTON, FLA.—Issue of $160,000 road and bridge bonds will be sold. Address H. W. Thompson, Co. Clk. of Santa Rosa Co.

TITUSVILLE, FLA.—Election planned in Brevard Co., on $300,000 road bonds. Address Co. Clk.

ATHENS, GA.—Election planned on $150,000 paving bonds. Address Jas. Barnow, City Clk.

BLUE RIDGE, GA.—Issue of $130,000 road bonds voted in Fannin Co. Address Co. Clk.

CARROLLTON, GA.—Issue of $200,000 bonds for road improvements in Carroll Co., will be sold. Address Co. Clk.

QUITMAN, GA.—Issue of $50,000 road bonds will be sold. Address Co. Clk. of Brooks Co.

BELLEVILLE, ILL.—Issue of $540,000 road bonds will be sold. Address Co. Supt. of Highways of St. Clair Co.

GENEVA, ILL.—Election in Kane Co., in Feb., on $1,500,000 road bonds Address Co. Clk.

TUSCOLA, ILL.—Election contemplated on $50,000 bonds for 3 mi of hard surfaced roads in Camargo Twp., Douglas Co. Address Twp. Clk.

MADISONVILLE, KY.—Issue of $500,000 road bonds voted in Hopkins Co. Address Co. Clk.

COLFAX, LA.—Issue of $600,000 road and bridge bonds voted in Dist. No. 9 of Grant Parish. Address Police Jury.

CADILLAC, MICH.—Issue of $200,000 road bonds voted in Wexford Co. Address Co. Aud.

HOWELL, MICH.—Election planned in Livingston Co. on $26,000 road bonds. Address Co. Clk.

ROLLING FORK, MISS.—Sharkey Co. plans to issue $650,000 road bonds. Address Co. Clk.

CARTHAGE, MO.—Jasper Co. plans to issue $250,000 bridge bonds. Adrdess P. E. Donnell, Co. Judge, Waco.

KENNETT, MO.—Election planned in Dunklin Co., on $1,000,000 road bonds. Address Co. Judge.

LAMAR, MO.—Election in Barton Co. in Feb., on $750,000 road bonds. Address Co. Judge.

PALMYRA, MO.—Election planned in Marion Co., on $500,000 road bonds. Address Co. Judge.

CROOKSKTON, MINN.—Issue of $250,000 road bonds voted in Polk Co. Address Co. Aud.

NEW BRUNSWICK, N. J.—Bonds voted for grading and, paving number of streets. Address City Clk.

BOONE, N. C.—Issue of $50,000 road bonds will be sold. Address Co. Clk. of Watauga Co.

TECUMSEH, OKLA.—Issue of $500,000 bonds voted for roads in Earlsboro, Davis Brinton, Forest and Rock Creek Twps., Pottawatomie Co. Address Co. Engr.

EUGENE, ORE.—Election planned in Lane Co., on $1,000,000 road bonds. Address Co. Judge.

BUTLER, PA.—Election planned in Butler Co., on $3,000,000 road bonds. Address Co. Compt.

HAZELTON, PA.—Issue of $500,000 street improvement bonds voted. Address City Clk.

CLINTON, S. C.—Issue of $100,000 street improvement bonds voted. Address City Clk.

LEWISBURG, TENN.—Issuance of $200,000 road bonds contemplated. Address Co. Judge of Marshall Co.

CAMERON, TEX.—Issue of $150,000 bonds voted in Rd. Dist. No. 29 of Milam Co. Address W. G. Gillis, Co. Judge.

CENTER POINT, TEX.—Issue of $65,000 road bonds voted. Address Town Clk.

CROCKETT, TEX.—Issues of $75,000 and $100,000 bonds voted in Rd. Dists. Nos. 14 and 15 of Houston Co. Address Nat Patton, Co. Judge.

EDNA, TEX.—Issue of $60,000 road bonds voted in Jackson Co. Address W. W. McCrory, Co. Judge.

GATESVILLE, TEX.—Election in Coryell Co., Jan. 10, on $1,000,000 road bonds. Address R. B. Cross, Co. Judge.

HONDO, TEX.—Isue of $800,000 road bonds voted in Medina Co. Address R. J. Noonan, Co. Judge.

JOURDANTON, TEX.—Proposed $100,000 road bonds defeated in Atascosa Co.

KENNEDY, TEX.—Issue of $300,000 road bonds will be sold. Address D. O. Klingeman, Co. Judge of Karnes Co., Karnes City.

LONGVIEW, TEX.—Issue of $100,000 road bonds voted in Gregg Co. Address E. M. Branlette, Co. Judge.

LUBBOCK, TEX.—Issue of $100,000 paving bonds voted. Address City Clk.

MADISONVILLE, TEX.—Issue of $50,000 road bonds voted in Madison Co. Address J. M. Roberts, Co. Judge.

CHEHALIS, WASH.—Issue of $138,523 road bonds will be sold. Address Co. Clk. of Lewis Co.

KALAMA WASH.—Election in Cowlitz Co. in Feb. on $700,000 road bonds. Address Co. Clk.

MONTESANO, WASH.—Election in Grays Harbor Co., Jan. 10, on $1,000,000 road bonds. Adress Co. Clk.

SPOKANE, WASH.—Issue of $3,250,000 road bonds voted in Spokane Co. Address Co. Engr.

GRAFTON, W. VA.—Election planned in Taylor Co., on $1,000,000 road improvement bonds. Address Co. Clk.

LOGAN, W. VA.—Issue of $1,000,000 road bonds voted in Logan Co. Address Co. Rd. Engr.

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Harrisburg, Pa.

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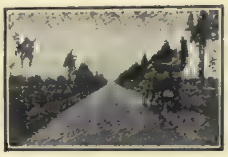

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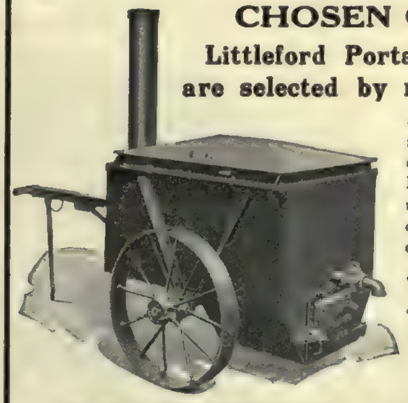

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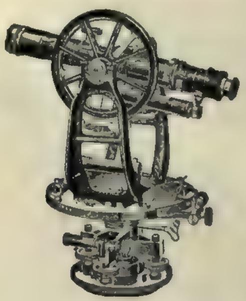

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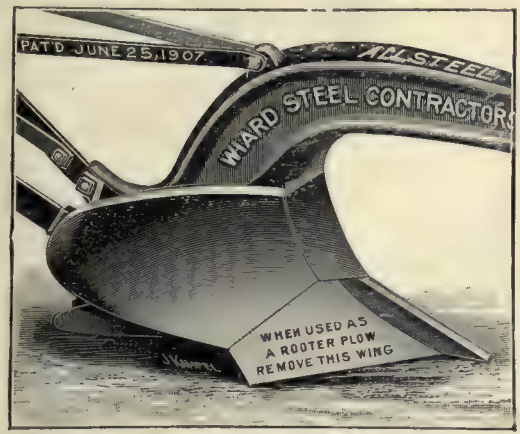

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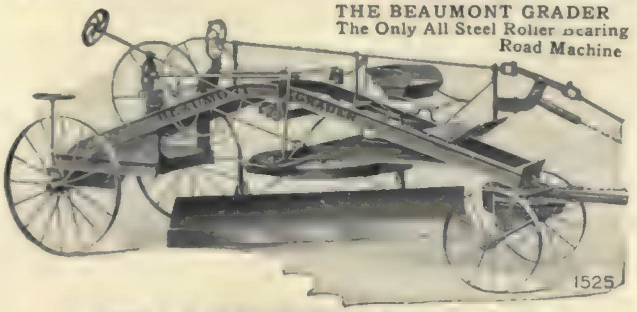

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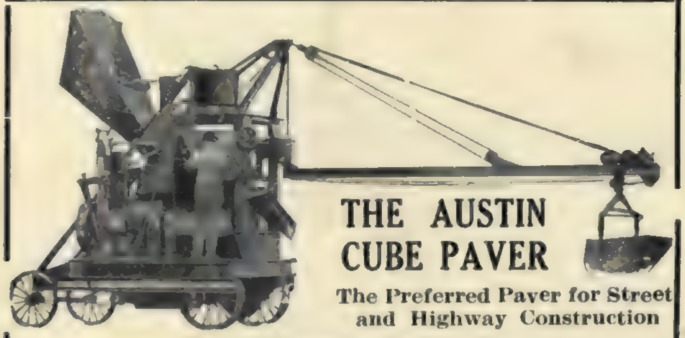

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